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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXXII. No. 3265.] LONDON, DECEMBER 9, 1925. [77TH YEAR. PRICE 1s.

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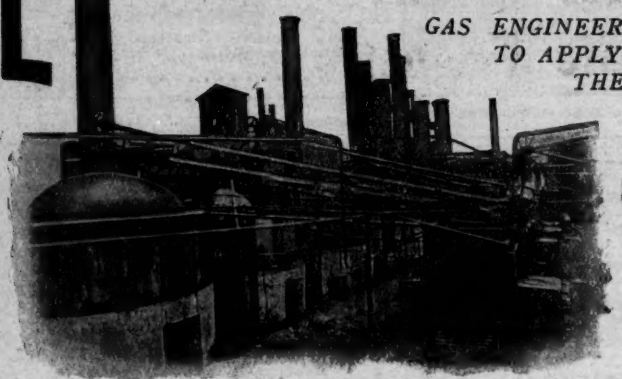

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VOL. CLXXII., No. 3265.] WEDNESDAY, DECEMBER 9, 1925. [77TH YEAR.

EDITORIAL NOTES.

Does the Gas Industry Need Overhauling?

A LITTLE reflection on current topics and problems relating to the gas industry suggests that there should be a serious settling-down to a review of the present position, in order to ascertain whether some really constructive work can be done at those points in its system where consideration of prospects submits that alteration is needed. In every direction in our daily affairs, modification or improvement of methods is required as circumstances change. We cannot go on for ever in the old ways when they do not adequately fit the mutations of the times. What is a good saleable article at one time may not be so when other conditions arise, which may be of external origin. What may be a perfectly good system of pricing and charging for commodities at one time may not be the best when a new order of competition confronts. These are matters which in an old-established industry demand examination from time to time in the light of the then existing circumstances. The gas industry is surrounded by competition to-day. So far as gas is concerned, it is doing well; but the question for examination is, Are there any changes which would enable it to do still better, and make itself stronger competitively. In the matter of coke, there is competition, and the low-temperature advocates are hoping to introduce further rivalry. Tar is competing with bitumen; and bye-product sulphate of ammonia is keenly competing with the synthetic product of other countries and with other nitrogenous fertilizers. There are to-day problems attaching to every one of these subjects. One which claims investigation and report is, Is the largely applied method of charging for gas on the flat-rate principle, with discounts, the best that can reign in the circumstances of to-day? The second is, Is it the duty of the gas industry, in the matter of secondary products, to give the consumers what they demand, or should the industry ignore consumers' requirements, and offer them what it thinks fit? The latter policy is the way to business decline; the former to its building-up and stabilization.

Let us take first the method of charging for gas, and put to ourselves a few questions. Why is it the electricity industry has adopted the two-part tariff so extensively as an alternative to flat rates? Is it necessary for the gas industry to counter that move? Why is it that in America gas engineers and administrators are keen (as Mr. G. M. Gill informed us in his Southern Association paper) to adopt the system—on, of course, a proper basis—as being more scientific and equitable than the flat-rate one, although so far only about 10 p.ct. of the gas undertakings in the United States have been able to apply it, owing to the objections of the ruling Commissioners, who are not always sympathetic to proposals to get out of the old grooves, and are hard to persuade that change is in the public interests? That the question of the method of charging for gas is also regarded as of importance here is seen by the fact that last July the Central Executive Board of the National Gas Council appointed a Committee to collate data which it is hoped will assist gas undertakings to frame a scientific and equitable tariff to meet their own particular circumstances, and, further, to determine how far the introduction of such a tariff would affect companies working under the sliding-scale. There are two ways by which changes can be effected in the system of charging. One is by differential prices. Power to make such prices is already possessed by some undertakings, while others are limited to a flat rate and discounts. The application of a two-part tariff is a more serious problem—particularly for sliding-scale companies. It is, however, a matter for consideration whether it would not be more beneficial than differential prices. To decide the point, the best way of approach is to consider the reasons which have induced its adoption by the electricity supply industry in this country and gas undertakings in America. It is obvious that differential prices cannot be applied without duplicate meters and piping or wiring as the case may be. There the two-part tariff introduces an economy. Another reason why in both instances this system of charging—having a primary fixed sum to cover capital and other standing charges—has been adopted is that a secondary low charge for gas or electricity encourages the development of consumption by each consumer. A strong point is also made by gas undertakings in the United States of the fact that there are many gas consumers who are actually unprofitable; and that an initial service charge which all consumers pay ensures that no customer is a burden on the undertaking and the consumers who are profitable. Also that the low secondary charge for gas is an incentive to additional consumption, and, the greater the increase, the lower becomes the average of the initial and secondary charge combined per 1000 c.ft. or (in this country) per therm. With a low secondary price per therm under such a system, we have an influential point for competition purposes—seeing that a low secondary charge per therm would compare with that per unit of electricity, or per 3412 B.Th.U. Knowing that a therm is 100,000 B.Th.U., the householder would readily see from which source the best value for money could be obtained. These are matters which require investigation by the gas industry, with both competition and business expansion in mind. In our methods and inducements we must be at least on an equality with, and wherever possible superior to, the competing industry.

Then there are the secondary products. What is going to be done about coke? Here it is a question of what householders want for their fire grates, and not what the industry would at present be only too pleased to sell them. We do not for a moment suppose that gas administrators and their technical officials, in face of the position of the coke market, are going to allow the opportunity to pass for doing some really good work in this direction, having in sight both competition and the spread of public opinion on the subject of smoke abatement, particularly in the direction of the domestic fire. The Leeds and the Sheffield Smokeless Fuel Conferences have divulged an increasing interest in this matter, especially by men who are not immediately concerned in the gas industry, but are associated with other industries, carbonization work, and fuel supplies generally. The matter is too important to be ignored; and the choice lies between the provision by high-temperature carbonization of a coke of suitable structure, or by low-temperature means of a coke containing a larger percentage of volatile matter than ordinary gas coke. We come to tar. In this regard, the discussion at the Public Works and Road Conference reported in last week's issue of the "JOURNAL," showed distinctly that

road engineers are desirous of giving full patronage to tar for road construction and surfacing, but they have their own views as to the characteristics it should possess. As editorially suggested last week, it seems to us that what is wanted in this respect is a round-table conference between representatives of the central organization of the gas industry and of the road engineers' organization to ascertain precisely what it is the latter require. As to sulphate of ammonia, a vast amount of work has been done (which is an example of what is wanted in other directions) in producing a quality of sulphate which meets with the views of purchasers in respect of nitrogen content, neutrality, and moisture. But withal complaint comes from foreign buyers that the sulphate sometimes reaches them in a solid caked mass. This point is being investigated in such a manner that the remedy is certain of realization. All these matters are of considerable commercial importance to the interests of the gas industry.

Road and Gas-Main Diversions.

AFTER the explicit decision that has been given by the House of Lords Committee, over which the Marquis of Bath presided, regarding the cost of gas-main alterations in the event of their being necessitated by road diversions, widenings, or other change, we hope the claim has been finally disposed of that has been preferred by county councils that such cost should be borne by the owners of the pipes, and not be (as justice dictates) part of the liability attending the change in the road itself. That is the law as it stands in the Gas-Works Clauses Act of 1847; and notwithstanding the age of that Act, and the many changes which have since come about in the use of roadways, the law as it exists, so far as this particular matter is concerned, is based as much to-day on equity as it was at the time of its passing. The contest has come upon the Special Order of the Northampton Gas Company, which was opposed by the County Council when before the Board of Trade, with the view of obtaining a protective clause containing several onerous requirements in favour of themselves and oppressive and unjust to the Company. The opposition was continued in Parliament, with the result that the Northamptonshire County Council have secured nothing but a concession made by the Company respecting the extension of the notice of road openings from three to fourteen days. Although the Council opposed, it was clear that they did not wish to press for a decision by this tribunal as to the cost of main shiftings in the case of road alterations; but they did want the Order to be hung up until—if ever—the conference of county councils, public utility undertakings, and the National Gas Council arrived at a decision. What they did not desire to come to pass has happened; and the conference can now proceed with the knowledge that the matter has been expressly and fully discussed before a tribunal of Parliament; the issue being that the claim of the County Council was rejected (see "Parliamentary Intelligence" in last week's "JOURNAL"). The decision confirms that of the Board of Trade regarding the question—that they were not prepared to make alterations in the general law, and apply them to a particular case, in the absence of an agreement between the parties, unless there were special circumstances. It not only does that; it also makes plain to highway authorities a point which they seem to have forgotten or overlooked—that those using the subsoil of roads are doing so, by the authority of Parliament, in pursuance of a public service, and the users of the surfaces of the roads have no superior rights. When the users of the subsoil of roads break open the road surfaces, they have to reinstate them to a satisfactory condition; but when the authority charged with looking after the road surfaces wish to interfere with gas mains, they say the owners should pay. In other words, they desire to place all possible costs upon the other public services, and get off as lightly as they can themselves. The question of equity does not disturb them. The Marquis of Bath's Committee have shown plainly what they think of the claim. In view of this, the County Council should carefully review the position, and in doing so should not fail to examine it from the points of view of other people. Then, perhaps, new light will enter their minds.

Recreation in Industrial Welfare.

THERE is nothing that appeals to the hearts of the majority of British workers so much as a good sportsman employer; and there is nothing that keeps the British worker more fit for his daily occupation than good healthy outdoor recreation, or, if he cannot take an active part in the exercises, convenience for watching them—something to interest and occupy his mind, something to talk about with his mates, and if his own fellow-workers are participants in matches, something in their successes of which to be proud. This side of industrial life we count as being as important to the fullest success of industry as research, the maintenance of machinery, and good organization. There is much else besides work which goes to make up the life of men or women; and the bent of interests outside the work which provides their livelihood has a large influence upon the work itself. We have heard employers say that this is true in an adverse sense—that the interest in sport preoccupies the mind of the worker, and has a distracting influence on his work. This may be true in some cases; but the general experience is that outdoor recreations promote in the greater number of employees good healthy minds and physical conditions which improve fitness for their work, and make it all the easier and the lighter.

In the gas industry employers have taken a large part in the promotion of industrial welfare; and an element in it has been the provision of grounds for cricket, football, tennis, bowls, and other games. Many of the larger gas companies have grounds for their men; and good use is made of them. Whether the municipalities cater in precisely the same way for their men in the several departments, we have no information; but we have our doubts. This we do know, that some public authorities who employ a large number of men consider that for them the provision of a public recreation ground is sufficient. This to our mind is not the same thing as the men of a big undertaking having a field, pavilion, and rooms of their own, under the control of a committee of themselves and an official of the Department as President or Chairman. There is a big difference—a pregnant psychological difference. Mentally it links together work and recreation; the men's interest in the one is fostered by the other. The recreation ground belonging to the company or the department which gives employment, promotes a feeling of part-ownership among the men, and this is an excellent thing. It also emphasizes that employers do not regard it as ordained that life should be devoted to all work and no health-giving play. Many of the manufacturers associated with the gas industry have their own workers' recreation grounds, and know the value of this in bonding the good will of the workers to the firm or company, and in contributing to the maintenance of sound mental and physical fitness among the employees.

These reflections are prompted by certain remarks which were made the other day at the opening, by Mrs. J. Wilfrid Drake, of a new ground for the Halifax Rugby Union Club, of which Sir William Bulmer is the President. That new ground has been provided by the generosity of Mr. Councillor J. Wilfrid Drake, who is not only a good citizen, but a broad-minded sportsman, and who views recreation and sport from the point of view of one who takes a keen interest in social welfare. To him recreation and clean and healthy sport are means to many ends for the improvement of the conditions of those who work with him and are fellow-citizens; and the magnificent ground and appointments which he has placed at the disposal of the Club are merely a handsome contribution by him to a good cause. In the Club and the ground, the men of his Company have close personal attachments. The ground is at Ovenden Park. From his study of these matters, Mr. Drake has come to the conclusion that it is preferable for recreation grounds for workpeople to be situated away from the places at which they are daily occupied. While the link is there, a little separation of recreation ground from the works detaches the one from the other in the mind, and so betters concentration during the hours of work and during the hours of play. There is something in this; and perhaps the point will be remembered by gas and manufacturing concerns who are considering the provision of recreation grounds or a change from those

already possessed. Whether or not there is agreement with Mr. Drake on this question of detail, there will be general agreement that the provision of means for outdoor recreation by the workers of any undertaking is productive of effects of a mutually material order.

Reducing Ammonia Plant Effluents.

THE Chief Inspector under the Alkali Works Regulation Act (Dr. T. Lewis Bailey) has set his hand to a piece of work the consummation of which he intends to achieve if effort on his part can enlist performance by the gas industry. He has, in the pursuit of his desire to be of service in this as in other matters, come out among the professional men of the industry, and his presence is heartily welcomed. By the way, there has of late been an excellent development of personal contact between the officers of governmental departments and the men of the industries with whose work there is official association; and this is all to the good. The Director of Gas Administration—first Mr. Honey and now Mr. Ronca—the Chief Electricity Commissioner (Sir John Snell) in connection with the electricity industry, and now Dr. Bailey, through the surveillance his Department has over certain of the operations of gas-works, have all set an example in this regard which cannot fail to be highly and mutually beneficial. In such relationships, to know each other well goes a long way towards the making of success. On more than one occasion, Dr. Bailey has addressed the gas industry on the subject of the noxious effluents from sulphate of ammonia plants; and his object has been to bring about a reform with the view of reducing the quantity of effluent and its noxious character, so that the objections of those who have to deal with the problem of sewage disposal may be nullified. As indicated, he has been keeping the matter alive; and his latest appeal for the adoption of practical methods of effluent reduction and improvement was made through a paper read at the recent meeting of the Midland Association of Gas Engineers and Managers. It produced a discussion which shows that the topic has secured a prominent place in the minds and plans of gas engineers; and Dr. Bailey must be gratified with the evidence of this.

Some suggestions have been made for the modification of the treatment of crude gas, so as to secure ammoniacal liquor considerably less charged with noxious impurities—such as phenols and thiocyanates—than obtains under prevailing conditions; and the recommendations put forward by Dr. Bailey, supplemented by what Dr. E. W. Smith and Mr. T. Campbell Finlayson said in their paper before the North of England Gas Managers' Association recently, suggest that it is reasonable to think that the end in view can be realized by quite economical means. Briefly stated, the recommendations are: Efficient removal of the tar from the hot gas above the dew point of the liquor; the utilization of effluent tar-liquor separators wherever tar and liquor are found together, with separate wells for the tar and liquor; the reduction to a minimum of the opportunities for oxidation of cyanogen compounds; the application of an acid catch for the extraction of the last 40 grains of ammonia from the gas; and complete elimination of the circulation of liquor, except where the liquor contains nothing but fixed ammonia, and is used hot in the hydraulic main. The adoption at the outlet of the scrubber of an acid catch or washer, whereby the volume of the effluent liquor would be lessened by approximately 50 p.ct., was the point that engaged most consideration in the discussion; and good experience was given regarding its use. The acid washers are simple to operate, and very little attention is required by them; and there need be no trouble in the purifiers by acid being carried forward—one suggestion being that all that is needed is to connect a 1 or 1½ in. pipe between the inlet and the outlet of the washer to allow a little crude gas to go forward. At the Bournemouth Gas-Works, Mr. P. G. G. Moon has been using an acid washer for years, and there has been such satisfaction with it that it has been adopted at the new Pitwines Gas-Works of the Company.

Dr. Bailey's advocacy in this matter of ammonia plant effluents is attracting much attention in the industry; and he may be assured that it will have good effect. The only point which will be closely scrutinized is that of cost, because in these days of low sulphate of ammonia prices and high manufacturing costs, the strictest economy is necessary. But, on the other hand, the duty of gas undertakings is not to create expensive difficulties for those who have to deal with the public service of sewage disposal; and a narrow watch is being kept to see that they do not do so. The discussion at the Midland Association meeting is reported in this issue.

Gas Light Standard Price.

The Public Control Committee of the London County Council have recommended that the application of the Gas Light Company for a revision of the standard price from 11d. to 11·4d. per therm shall not be opposed. They think it is probable that the increase could be justified in present circumstances; but, in refraining from opposition, the Committee submit that the Council should not be prejudiced as regards future applications for standard price alterations. The authorized dividend for 1925, in present circumstances, will be £5 1s. 4d., which is 5s. 4d. below the authorized dividend for 1924. The increase of the standard price by 0·4d. would restore the figure of £5 6s. 8d. Some of the newspapers proclaim that this means dearer gas. This does not necessarily follow, seeing that an increase would again reduce the dividend.

The Duty on Imported Gas Mantles.

At two sittings last week, the members of the House of Commons were engaged in discussing and passing resolutions referring to the recommendations of the various Committees appointed by the Board of Trade to consider applications for a duty on certain imported goods. Among them was a resolution regarding gas mantles, to which reference was made in the "JOURNAL" last week. The President of the Board of Trade (Sir Philip Cunliffe-Lister) moved for authorization to impose a duty of 6s. per gross on imported gas mantles, and 4s. 6d. per pound on impregnated hose or stockings for use in the manufacture of mantles. There was agreement with this. The resolutions will now have to be embodied in a Finance Bill. On the general subject of safeguarding, a vigorous onslaught was made by the Socialist-Labour members on protection of any kind for home industry. The whole discussion showed the strange mentality of some of the Socialist leaders, who would prefer that hard-hit industries should be still further oppressed by the productions of foreign labour rather than that a measure of protection should be given to the home industry, in order that the position of British workers might be safeguarded. Furthermore, it passes their comprehension that new capital cannot be attracted by hard-hit industries without some protection is given them—in fact, a great deal of capital has been idle and employment sacrificed through British factories being unable to work to their full capacity, owing to the activities of foreign producers in using this country as a happy dumping-ground for their goods. Great is the outcry in the German Press against these protective duties on specially oppressed industries in this country. Nevertheless, for generations past, Germany has imposed duties on the imports of other countries. When, however, it comes to Great Britain doing in a small way what Germany has been doing in a large way for many years, it is a terrible shock to the latter country.

Sulphate of Ammonia Prices.

The last circular issued by the British Sulphate of Ammonia Federation, Ltd., regarding prices for sulphate of ammonia shows a progressive and welcome rise in them for home agricultural use up to deliveries for May next. The price for December delivery is £12 13s.; for January, £12 15s.; for February, £12 18s.; and for March to May, £13 1s. In all cases this is for neutral quality, in fine friable condition, free from lumps, with a basis of 21·1 p.ct. nitrogen. It is pointed out that neutral sulphate of ammonia at these prices is the cheapest reliable form of nitrogen on the market. At the figures named for sulphate of ammonia, nitrate of soda should not cost more than about £9 12s. per ton, carriage paid to any station in Great Britain, inasmuch as the nitrogen in sulphate of ammonia is 21·1 p.ct., and in nitrate of soda 15·5 p.ct.

Dwindling Oil Resources of U.S.A.

According to a report from Washington, the Oil Conservation Commission, which was appointed by President Coolidge, give the information that a complete survey of American oil resources reveals that the supply will be exhausted in the next seven years, at the present rate of consumption. We have only the authority of the newspaper statement regarding this. If it is true (prior reports from other sources give some reason for doubt), the situation is one which will cause the United States grave concern. However, the report declares that the President will be advised to recommend that the use of oil in industry be immediately abandoned, and that coal and water power for electricity be employed whenever possible. It is also stated that the Government investigators place little reliance upon a recent report of the American Petroleum Institute, which estimated the oil resources of the country at 26,000 million barrels. It is believed by the Commission that the bulk of this reserve cannot be produced by any known method; and it is emphasized that the promise of new sources of supply being discovered is mere prophecy. The position is one which calls for far more definite information before placing any considerable dependence upon the statements; but should unfortunately the estimates prove true, it will mean that the United States will have immediately to adopt a policy of the strictest conservation.

The Coal Subvention.

The payments under the State subsidy for the support of the coal-mining industry during the period of inquiry by the Royal Commission are gradually creeping-up to the limit of the vote of 10 million sterling made by Parliament. Up to Nov. 30, the aggregate amount claimed and paid was £6,037,451. This total is made up of £1,610,164 for August, £1,795,380 for September; and £2,631,907 for October. Thus each month has shown a gradually rising figure. We shall probably have a further vote before Parliament rises. In continental quarters—particularly Germany—the Press and the coal owners are raving about the British coal subvention, which they say has created unfair competition with them; and they are of opinion that they ought to be protected against British "subsidized" coal.

Gas Fires and Coal Prices.

The cold weather and fog have between them caused a fine impetus in the applications for gas-fires; and those people who took advantage in the summer time of the offers of gas undertakings to fix such appliances on low terms must regard themselves as fortunate that they are not as others who find themselves on the "waiting list." The coal merchants in London have added to the retail prices of the different grades of coal figures ranging up to 2s. per ton, which they say represent the increased cost to them at the collieries. The result is that the prices now range between 42s. for kitchen nuts to 54s. for best coal. Anthracite nuts are quoted at 86s., while coke is on offer at unchanged prices.

Coal Mine Nationalization.

The Miners' Federation have worked-up the Socialist-Labour party in the House of Commons to the acceptance of a proposal to introduce a Bill for the nationalization of the coal mines—this notwithstanding that the problems of the industry are being probed at the present time by a Royal Commission, who are taking the question of nationalization into consideration among numerous other pertinent topics. Apparently the Miners' Federation cannot wait until the Commission conclude their labours; they want to push on with their Communistic policy. Perhaps they have visions that the Commission will not be favourable to the suggestion of nationalization. If the Miners' Federation cherish any thoughts of being able to induce Parliament to pass a Bill for the nationalization of the industry, despite anything the Commission may have to say, we are afraid they are doomed to disappointment. However, the Federation are very anxious that the whole of the Socialist-Labour party in the House should support their measure. It has been under the consideration of the party; and, as a result, a somewhat piquant situation has been created respecting the principle of compensation to the owners. The Miners' Federation cannot see that any seizure of the property of the employers of their members would be robbery; but the consciences of some of the members of the Socialist-Labour party will not allow them to take part in a proposal for stealing other people's goods, whatever their character. Thus there appears to be a deadlock. Regarding the much-debated question as to whether the colliery owners have shown enterprise since the war, it may be mentioned that during the years that have elapsed since the Armistice, no less than 70 million sterling has been spent in opening-up new pits and developing old ones.

PERSONAL.

Alderman FIDDIAN has been elected to the Chairmanship of the Stourbridge Gas Committee for the 21st time. The Mayor (Mr. Randle L. Matthews) made graceful reference to the record.

Mr. SALISBURY JONES, late Managing-Director of Low Temperature Carbonisation, Ltd., has severed his connection with the Company on account of continued ill-health.

Mr. H. T. MANLEY, who has served several terms as an Employees' Director of the South Metropolitan Gas Company, has now retired from the Company's service, in which he has spent 44 years. The members of the Old Kent Road Foremen's Association have presented him with a lock, and Mrs. Manley with a gold brooch.

Alderman C. TOWNSLEY, an ex-Mayor of Nelson and the Chairman of the municipal gas undertaking, has been appointed a County Magistrate for Lancashire.

OBITUARY.

As we go to press with this issue, we learn with regret of the sudden death of Mr. J. M. MACMORRAN, who possessed an extensive knowledge of South American affairs. He was for a long time Secretary of the Primitiva Gas Company of Buenos Ayres, Ltd., and was appointed a Director in October, 1924, to fill the vacancy on the Board caused by the death of Sir A. E. Bowen, Bart. Other companies on the Boards of which he sat were the Bahia Blanca Gas Company, Ltd., the Province of Buenos Ayres Water Works Company, Ltd., and the South Barracas (Buenos Ayres) Gas and Coke Company, Ltd.

The death occurred recently, after a long illness, of Mr. H. T. ADKINS, who was Secretary of the River Plate Gas Company, Ltd., prior to the amalgamation of that undertaking with the Primitiva Gas Company of Buenos Ayres, Ltd. He was P.Z. of the Evening Star Chapter.

The death occurred recently of Alderman KAY, who was Chairman of the Bury (Lancs.) Gas Committee. The new Chairman is Alderman BRADLEY.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Dec. 10.—MURDOCH LODGE.—Meeting.

Dec. 12.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the works of the Hornsey Gas Company.

Dec. 12.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Bradford. Paper by Mr. J. W. Wood, M.Sc., on "Aeration of Burners."

Dec. 17.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at No. 28, Grosvenor Gardens, S.W. 1, at 2.30.

Dec. 18.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute.

Distribution Department Lectures at Leamington.—Recently it was suggested by one of the assistants of the Leamington Priors Gas Company that if they could have lectures given in the demonstration room at their showrooms, on topics affecting the work of the distribution department, the men would attend them, and both they and the Company would benefit. So far lectures have been given by Mr. G. Sawyer, of Messrs. Wm. Sugg & Co., Ltd., on "Incandescent Gas Lighting," and by Mr. W. L. Stringer, on "Gas Fires." Both lectures were very well attended by the men and youths in the distribution department in their own time, the lectures commencing at 7 p.m. Others who have promised lectures are: Messrs. Jackson Boilers, Ltd., on "Jackson Water Heaters;" Sidney Flavel & Co., Ltd., on "Gas Cooking Appliances;" and George Wilson, Ltd., on "Gas Meters."

ELECTRICITY SUPPLY MEMORANDA.

AMONG the witnesses who have been before the Coal Commission is Mr. C. H. Merz, whose name will be recognized as that of the well-known electrical expert who has been largely responsible for the development of electricity supply on the North-East Coast. The developments he has made there are held up as a model to the remainder of the country, and are conveniently forgotten when people desire to belittle the accomplishments of the electrical men in this country, as compared with those of their professional compeers of other countries, who are working in totally different circumstances. For what Mr. Merz has done on Tyneside through the Companies in which he has prominent position, he deserves the utmost credit. But all the same, our political leaders cannot find that in the area served by those Companies electricity power has done anything more to stimulate industrial work, and therefore to maintain employment, than is the case in the electrical conditions of any other part of the land. One matter upon which Mr. Merz dwelt when before the Coal Commission was that of improving the efficiency of the generation of electricity. This is a problem which appears to be insoluble. The very best so far accomplished is between 18 and 19 p.ct.; and the only piece of embroidery they can discover for this, in the hope of enhancing a poor efficiency reputation, is the pre-carbonization of the coal used, and the sale of the products therefrom—utilizing the gas, and probably gasifying the coke, for the purpose of electricity generation. How this is going to provide genuine improvement, it is difficult to see. What it would mean is that the scheme would necessitate the handling of a greater amount of coal by the electricity industry, which would be accompanied by, for the market, additional liquid and other products, which have the bad habit of vacillating to such an extent that there can be no reliance upon their financial results. However, Mr. Merz appears to be sitting on the fence in this matter. On the one hand, he sees economy resulting from the pre-carbonization of the coal before use for generating electricity; on the other hand, he says it is, of course, purely an economic question, depending upon the cost of coal and the value of the bye-products. He also suggests that, to make of it an economic process, it would have to be conducted on a large enough scale. Upon this we would remark that the larger the scale, the more effective would be the influence of a bad state of the secondary products markets upon the economic position of an electricity undertaking. It is not such a simple matter as Mr. Merz seemed to convey to the members of the Commission; and this he knows full well. But why cumber the country with additional carbonization plant, and increase the supplies of the secondary products, which are now at such low value owing to the operation of the law of supply and demand? One cannot guarantee the maintenance of such markets at any precise level; and when carbonizing works are already established to supply gas all over the country, there we have the places where any additional carbonizing should take place, to make the utmost success of the conservation of coal. We see no reason why gas undertakings should not be able progressively to supply the necessary quantity of coke which can be so effectively used with certain of the lower grade coals or slacks for steam-raising purposes, to the economic advantage of the electricity undertakings, and to the benefit of the neighbourhoods of their generating stations, owing to the reduction of the pollution of the atmosphere by smoke.

Pre-Carbonization.

Santa Claus.

Our electrical friends always go into ecstasies a few weeks before Christmas over the stocking by contractors and retailers of their shops with electrical goods which are considered to be suitable for Christmas gifts. They are exhorted to see that their stocks are of a character which will especially attract the feminine mind. Flat irons are among the gifts considered to be suitable for a husband to present to his wife. The probability is that if a husband had the audacity to give anything of the kind—the flat iron suggesting work and not enjoyment or personal adornment—he might be met with sour looks. In another place, we find that a suitable electric gift is considered to be an electric fan. Why fans should be required in the winter time passes our comprehension, except it be for the removal of the stagnant air from rooms where electric lamps are employed. "What shall I buy him?" The lady ponders over the matter; and the suggestion comes through our electrical contemporaries, or through the showroom windows of the electric supply undertaking, that a small radiator would be a suitable present. A small radiator in the depth of winter is something which, unless used in an air-tight and box-like room, causes the user heartily to denounce electricity and all its pretensions to be an excellent and economical heater. This reminds us that, during the recent spell of extremely cold weather, a small radiator in a private ward of a certain hospital was placed near a patient so that she should "enjoy" the radiant heat. Within a minute or two after this had been placed near the bed, a fuse went, and there was a flash of flame which nearly sent the patient through shock into the next world, which was not what she went to the hospital for. No electrical salesman had better approach this lady in future. Among other things illustrated as suitable Christmas presents, are electric bed warmers. Now electric bed warmers are all right so long as they are carefully attended to, and do not misbehave themselves. But in the case of bed warmers, fuses sometimes kick over the traces; electric warmers have also been known to be put into beds, forgotten, and, through becoming overheated, have found escape through the bed clothes and mattresses. Then we see that such things as table lamps, egg-boilers, electric kettles, and shaving-pots are advocated as useful presents. Regarding these goods there is nothing much to be said, except that, if people want them, they will buy them, whether it be at Christmas or any other time. About shaving-pots, we have very grave doubts, as they are not inexpensive, and men we have known who have had them given to them either as Christmas or birthday gifts, or probably have been foolish enough to invest their own money in them, have found occasion to be somewhat unscrupulous in their language when they find, a few days after the acquisition, that the thing has gone wrong, and that the remedy is almost as costly as the original price of the pot itself. We see, too, that electric grillers or combined grillers and boilers are suggested as suitable Christmas presents. We do not agree with the suitability. Moreover, if people require a fire, griller, boiler, or geyser, they can find something of greater durability and constancy, and more economical, by applying at the nearest gas showroom. We hope that nobody will send anything in the nature of an electrical gift to the writer of "Electric Supply Memoranda," as he is confident that he could choose something of greater utility or of personal value.

Gasfilled Lamps and Flex.

"Megohm" of the "Electrical Times," in his "Notes on Wiring," recently dealt with an inquiry from a correspondent on what he says may be a problem which will become shortly a "burning" question in both senses of the term. There is no doubt that it is. The inquiry was as to whether "Megohm" had found that where gasfilled lamps are used on flexible pendants the rubber of the flex deteriorates very rapidly near the lamp holder due to the heat, and, if so, could he tell his correspondent which type of flex should be used to avoid the trouble. We know there has been a considerable amount of difficulty from this cause, and "Megohm" believes there has been. Of course, he not only believes it, but he must be perfectly well aware that it is true. This is one of those points where the electrical industry has completely failed to make necessary changes to suit new conditions. When gasfilled lamps with the much higher filament temperatures came into use, it was long before it was appreciated that the higher intrinsic brilliancy required special treatment in the way of protection of the organs of vision against the injurious effects of the rays. This has been a trouble from the time metallic filament lamps came into being; but it was so greatly intensified by the gasfilled lamps that there should have been immediate action to prevent their use without proper safeguards. The same applies to the use of unsuitable pendants with these lamps. The old pendants answered all right with lamps running at much lower temperatures; but it did not follow that they would be equally suitable for lamps working at such high temperatures as those of the gasfilled type. A little reasoning on the part of electrical men ought to have shown that this would be the case. As the writer in our contemporary says: "The lamp-holder must get hot by conduction, and, if of a very light type, it will attain its final temperature more quickly than a heavy gauge one." That is also true; but it does not follow that the lighter gauge holder would do more damage than the heavy one, owing to the fact that, being of lighter gauge, it would dissipate its heat more quickly to the surrounding atmosphere. "Megohm" says he has been pretty free from this flex trouble in the installations for which he has been responsible. This he attributes to the fact that he invariably specifies heavy gauge lamp holders with substantial cord grips and 20-mil. double-runner, circular braided flex. In his view, the wooden cord grip affords a certain amount of heat insulation between the lamp-holder and the rubber of the flex, although not very much.

Small Talk.

It was at the British Electrical and Allied Manufacturers' Association dinner that Lord Weir made a speech which practically divulged the contents of the Weir electricity report, and which speech formed the subject of an editorial in the "JOURNAL" for Nov. 25, p. 491. On that occasion the President of the Board of Trade, Sir Philip Cunliffe-Lister, wisely pointed out that our friends of the electricity industry must not run away with the idea that their commodity can replace gas; neither can gas replace electricity. With that point every intelligent individual will agree, because each commodity has a sphere from which it cannot possibly be dislodged. "Meteor," in the "Electrical Times," compresses what Sir Philip had to say into: "Each has its scope, each will endure, each is complementary of the other, the two should get together." And then we come to the small talk by our

friend. "We imagine that much the same thing was said of bows and arrows when guns were introduced." Dear philosophic boy! "Bows and arrows still have their sphere." Marvellous! "We saw an illustrated account the other day of bear-hunting in which the bow was used because of its silence." How observant! "Gas will always have its uses for blow-pipe work and certain industrial processes; but the day will come when people will look back with horror at the idea of a network of corroded pipes supplying a highly poisonous explosive to innocent householders." Worthy of a badly-instructed schoolboy! "Meteor's" simile is misapplied. The "bows and arrows" surely represent electricity, and the guns our more effective commodity—gas. When one considers the efficiency of the electrical process of generation, and compares it with gas, and further takes into account the pigmy amount of potential heat energy which electricity supplies for a given sum of money, as compared with the amount which gas furnishes, it is easy to see how well "Meteor" has succeeded in swelling his accumulation of weekly nonsense. The "horror" of people over a network of corroded pipes is another example of the foolish writing to which "Meteor" treats his readers. When one looks at the expansion of the gas industry—an expansion which proceeds day by day—and finds the industry more strongly entrenched at the end of one year as compared with the end of the preceding one, it shows that the "horror" is something which exists only in "Meteor's" imagination, and certainly not in the public mind. At the same time, we are not disposed to quarrel with "Meteor" when he says: "Let electricity and gas compete with all possible intensity, and let the fitter of the two survive. Any course other than this would be in restraint of trade. It would be in the worst possible interests of the population." Maybe they will both survive. We should not be at all surprised.

TAR FOR ROAD SURFACES.

In the paper on this subject which he submitted to this year's meeting of the German Gas Association ("Das Gas- und Wasserfach" for Oct. 10), Dr. Hans Lüer, of Essen, acknowledged that Germany has not much to teach England in the use of tar for road making. He quoted from the report of a German deputation to this country, which had been sent to study our methods of road making, figures which showed that the production of tar macadam was at the rate of more than five million tons a year, and that, in all, some 500,000 tons of tar were used on the roads, or about one-third of the total tar production. This compares with an estimated consumption for the year 1924 of only 3000 tons of tar in Germany for road making.

Dr. Lüer, who himself visited England twice last year to study the subject, sums up his observations under five main headings:

1. With the assistance of the gas-works chemist, a tar of consistent quality and known composition must be delivered to the road authorities. There must also be conviction that it is such as will give satisfactory results under the local conditions.

2. Gas-works crude tars should not be delivered, as they are unreliable. Only "prepared" tars should be used—that is to say, consisting of anthracene oil and pitch—or "distilled" tars (*i.e.*, free from water and light oil, distilled up to 170° or 200° C.).

3. The specific gravity should be determined at 15° C., as a standard of the viscosity.

For use under ordinary conditions on unprepared surfaces which have not previously been tarred, the specific gravity should not exceed 1·24, nor fall below 1·14. Tar of lower specific gravities should only be used for roads which have previously been tarred. On old, absolutely compact surfaces, even anthracene oil has proved successful in certain circumstances. Within the above limits, such tar must be used as is most suited to local conditions, as, for instance, the weather, the traffic, the subsoil, and the surface formation. As a general average, the author suggests prepared tar of specific gravity 1·17 to 1·18.

4. As a basis for fractional distillation, the following is suggested:

Up to 170° C.,	not more than	1	p.ct.	by	weight.
,, ,, 270° C.,	,, ,, ,,	24	,,	,,	,,
,, ,, 300° C.,	,, ,, ,,	12	,,	,,	,,
Phenols . .	not more than	5	p.ct.	by	volume.
Naphthalenes	,, ,, ,,	8	,,	,,	,,
Free carbon	,, ,, ,,	22	,,	,,	,,

5. From 3 to 20 seconds' immersion time must be allowed for the completion of the specific gravity determination with the Hutchinson tar tester.

Above all, careful work is necessary in road-tarring, and additional time and labour spent at the beginning are amply repaid in the long run. No elaborate machinery is required, and excellent results can be obtained with simple cauldrons, watering cans, and brooms, if due care is exercised.

THWAITES CONTINUOUS VERTICAL RETORT.

Some years ago, small-scale experiments on the low-temperature carbonization of coal in a vertical iron retort 7 ft. in length were carried out by Mr. R. E. Thwaites in Brisbane, using coals from several mines on the Maitland Field. These coals have about 40 p.ct. of volatile matter, and under 6 p.ct. of ash. They give a firm coke, and are largely used in Australian gas-works. The coal was heated to about 600°, and yielded light tar up to 36 gallons per ton, and gas equivalent to 3800 c.ft. per ton—the tar being very rich in light oils. With these results in mind, a special continuous vertical retort was designed and patented by Mr. Thwaites, with the object of carrying out low or medium temperature carbonization of coal in such a manner as to obtain a reasonably large throughput per retort. In 1921 a single-unit full-size retort was erected on a gas-works in Melbourne, with the objects of examining the process technically and of exploring the economic possibility of thus producing motor spirit, fuel oils, coke briquettes, and ammonia from the coal; the gas being used for works purposes or sold at power rates. Financial reasons prevented the completion of the programme, but conclusions were arrived at by Messrs. Thwaites and Packer which were published on Nov. 20 in the "Journal of the Society of Chemical Industry."

The patented firebrick continuous vertical retort in which the experiments were made was a cross between Glover-West and Woodall-Duckham designs, possessing seven pairs of horizontal combustion chambers, capable of heating the whole length of the retort, but a section like a Woodall-Duckham, and dimensions similar to the 5-ton a day retort of the latter. Provision was made for heating the retort either by producer gas or coal gas, although the former was used throughout the tests, on account of its smaller cost. A new feature was an arrangement for returning crude gas after condensation and water scrubbing to the base of the retort, at the coke chamber, in lieu of steam, for the double purpose of cooling the coke and carrying the sensible heat up into the coal, to quicken carbonization; or (after passing through a metal tubular preheater set in the chimney at the top of the setting and then down through brickwork channels built alongside the waste gas uptakes) at the level of the lowest combustion chambers, for the purpose of aiding the external heating of the coal by internal heating by hot coal gas.

Using a strongly caking coal, with both external and internal heating, the throughput for the temperature conditions investigated increased by nearly 60 p.ct.; but heating internally with inert gases greatly increases tar fog, and renders complete precipitation of tar more difficult. Their broad conclusion is that the mechanical difficulties due to sticking of the charge with caking coals makes this means of increasing throughput unsuitable to narrow retorts which are also externally heated. This difficulty, they say, would no doubt disappear with a non-caking coal, and could probably be overcome by a proper blending of suitable caking and non-caking coals. As a result of the investigation, however, the authors feel very favourably impressed with the possibility of internal heating alone at moderate temperatures by preheated retort gas in wide retorts.

Sand Blast to Clean Boiler Surfaces.

It is reported that the Consolidated Gas, Electric Light, and Power Company of Baltimore have been making extensive use of a sand blast to clean metal surfaces prior to the application of protective coatings. The result of the experiments would, the report states, seem to indicate that the sand blast is effective in the removal of clinker from metal surfaces, and that where these surfaces are reasonably flat, and the sand blast is applied in approximately the same plane as the surface, only very slight, if any, erosion will occur. The use of the sand blast, however, for removing clinker from boiler tubes, while effective, results in the erosion of the tube surface to such an extent that the protracted employment of this process will probably cause extensive tube deterioration, for which reason it is felt that it should not be resorted to except under extreme conditions, and then only in the hands of an expert. The apparent ease with which the sand blast removed rust and other extraneous substances led to the belief that it might be profitably utilized for the removal of clinkers from the lower rows of boiler tubes, as well as from the radiant heat superheaters. Slag having an average thickness of 2½ in. to 3 in. was removed from the surface of the superheater in eight minutes, requiring the use of approximately 60 lbs. of sand. The sand blast was directed, on the average, for nine minutes on to the lower rows of tubes, during which time approximately 70 lbs. of sand was used, which resulted in all the clinker being cleaned off. There was, however, unmistakable evidence of erosion of the tube surface at isolated spots where the sand had been in contact with the tube for more than a fraction of a second. In order to obtain some figure by which to measure the amount of damage that might be done, a short section of 4-in. No. 8 gauge tube was set up, and the sand blast allowed to play upon it in one spot for six minutes, during which time approximately 60 lbs. of sand was used. At the end of this time a hole of fair size had been made in the tube.

COAL BLENDING.

By R. K. STOCKWELL, M.A.S.C.E., M.A.I.M.E., Assoc.I.M.M., British Engineering Manager, the Robins Conveying Belt Company, Associated with Fraser & Chalmers Engineering Works.

At the conference on "Solid Smokeless Fuel," held at Sheffield University on Nov. 20, by the Chemical Group, the repeated mention by speakers of the problem of blending coals, and the requests made that information be forthcoming regarding suitable apparatus to solve this problem, suggest that a description of methods now in use might be of interest.

In coke oven practice it has long been the custom to mix coals, and at some plants as many as six different kinds of coal are mixed together to make the charge; while in a great many plants it is common practice to mix four kinds. The necessity of exactly proportioning the different kinds of coal making up the charge, and of being able to alter these proportions easily yet definitely to any new combination required by a change in coal received, and also to mix together intimately the different kinds of coal, led to the development of the Robins measuring coal mixer, illustrated in fig. 1.

This mixer is composed of as many belt conveyors as there are kinds of coal to be mixed together. As shown in the illustration, the four conveyors take coal from as many overhead bunkers, containing coal that has been broken to 1¼ in. by a Bradford breaker. The two upper conveyors take from two centre bunkers, while the two lower conveyors take from the two end bunkers. The belts run over special idlers, and are fitted with steel side boards to carry a thick bed of coal. The height of this bed is determined by a special adjustable gate. Thus, the speed of belt being known and the cross-sectional area of the bed of coal carried being easily determined by adjusting the gate, the volumetric measurement of the coal is exact for each conveyor, and may be increased or decreased at will.

At some plants the exact proportioning of the different kinds of coal to be mixed is of great importance. A change of mix such as might be accidentally caused by the stoppage of one kind of coal might make a swelling charge or create some other serious contingency. To guard against these happenings, the volumetric and speed controls are locked after being set, and can only be altered by the superintendent, chemist, or whoever has charge; the chutes from the bunkers overhead are very large, to give the coal free passage and avoid arching; there is an arrangement on each conveyor which in the event of a failure of coal for that conveyor will make an electrical contact that rings a large alarm bell and automatically shuts down the whole mixer; and also, in the event of any conveyor stopping, the alarm bell rings and the other conveyors are immediately stopped automatically.

As a rule, the coal is cleaned of foreign matter and broken to 1½ in. or 1¼ in. before mixing, and the mixer discharges directly to the pulverizers. Fig. 2 shows a typical installation. The three inclined belt conveyors at the left of the picture take coal from the truck tipplers to the Bradford breakers in the top of the coal station. These breakers remove all foreign matter—such as pieces of iron, steel, wood, slate, bone coal, sulphur balls, &c.—break the coal to 1¼ in., and discharge to the bunkers feeding the measuring mixer. Generally there is only one belt conveyor to the breakers, and one kind of coal only is handled and broken at a time as far as the bunkers. The hammer mills, directly under the mixer, pulverize the coal to the size required, and discharge to the belt conveyors shown inclining up from beneath the coal station and leading to the fine coal bins for filling the oven charging machines.

Many plants are arranged in this way, with the breakers, bunkers, mixer, and pulverizers in one station. Among these are the plants of the Providence Gas Company, the American Steel and Wire Company, the Domestic Coke Corporation, the Donner Union Coke Corporation, the Gulf States Steel Company, the Pittsburg Crucible Steel Company, and the Seaboard Bye-Products Coke Company. The plant of the Tata Iron and Steel Company, at Jamshedpur, India, is also of this design; but the Bradford breakers have not yet been installed, as the coal received is small. These breakers are, however, often used for their coal cleaning action alone. Some plants are built with the breakers on the ground level, with conveyors to elevate the cleaned crushed coal to bunkers over the mixer and pulverizers. This design has certain advantages, among which the location of the heavy breakers on a concrete foundation at ground level, instead of high up in a steel building, and the use of smaller belt conveyors to elevate the small crushed coal, are obvious. Among plants built to this design may be mentioned those of the Rainey Wood Coke Corporation, the Birmingham (Alabama) Coke and Bye-Products Company, the Lackawanna Steel Company, and the National Tube Company. Others, like the great Gary Works of the Illinois Steel Company, and the Republic Iron and Steel Company, have the hammer mills immediately following the Bradford breakers, and place pulverized coal in the bunkers over the mixer.

The Bradford breaker (mentioned in a number of the Coke Competition papers) is illustrated in fig. 3. This is fundamentally a large revolving or trommel screen, made in numerous sizes from 6 ft. diameter by 8 ft. long to 12 ft. diameter by 22 ft. long. This large screen is enclosed in a dust-tight steel housing, and revolved slowly. Run-of-mine coal is fed into one end, and as the screen revolves the coal is carried up by shelves, fixed lengthways within the screen, and dropped to the bottom. The coal advances through the screen, and is lifted and dropped many times. The screen plates are of thick steel, and are fitted in 2 ft. square sections for ease of replacement. The coal drops through the screen holes as soon as broken to the proper size; and it is seldom that a piece of coal comes out of the discharge end. On the other hand, all refuse and foreign matter come out at the discharge end; and the elimination of this refuse improves the coke structure and analysis by notably reducing the ash and sulphur content. The capacities of these machines are very large—up to 450 tons of coal per hour for the largest size—and the operating and maintenance costs are low.

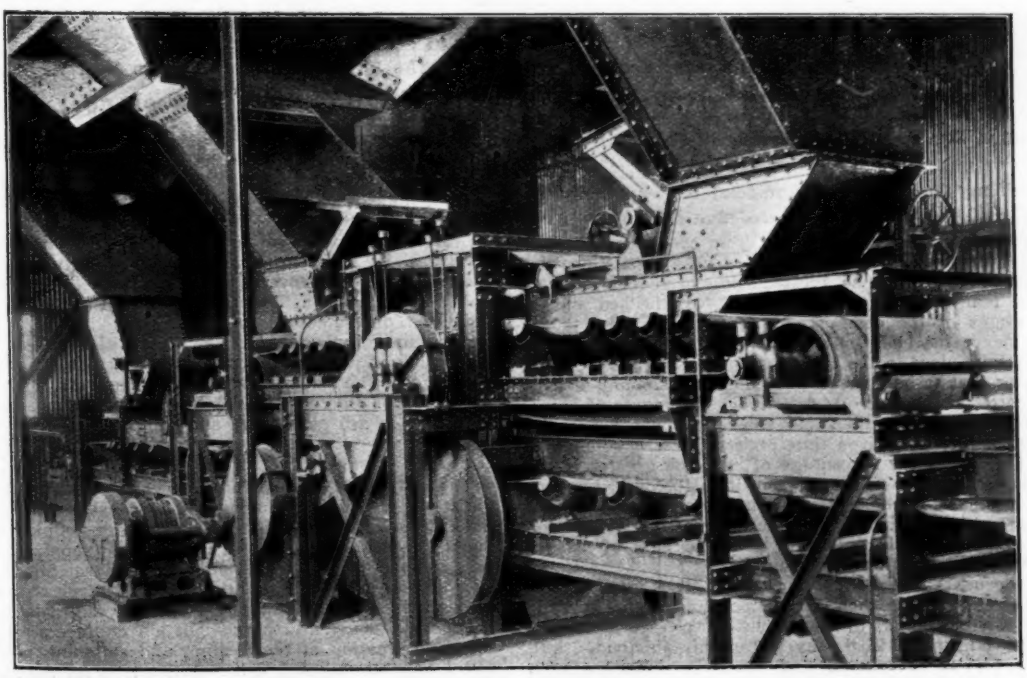


FIG. 1.—THE ROBINS MEASURING COAL MIXER.

CHARGE PROPORTIONING IN OTHER INDUSTRIES.

It is interesting to know how similar problems have been solved in other industries. Examples of charge mixing in the coke oven industry have been given, but charge proportioning and mixing have been developed to much greater elaboration and exactness in other metallurgical industries; and we might learn something from them to our advantage. For instance, the reduction of 75 p.ct. in the cost of producing copper during the past twenty years has been due principally to improved methods of handling the raw materials. This is another example of the study given to the problem of proportioning and mixing in the Robins system.

At copper works such as those of the Arizona Copper Company, the Calumet and Arizona Copper Company, and the Tennessee Copper Company, in America; the Cananea Copper Company, in Mexico; and the Cerro de Pasco Copper Company, in Peru, where high-grade valuable copper ores are directly smelted, a large quantity of ores are received in many small and diverse lots, with their chemical constituents differing widely. In the past each lot was treated separately; and this made production very costly.

Now, 5000-ton charges are made up. All ores received are carried by belt conveyor to a mill which crushes, weighs, and

Fig. 2.—Lehigh Coke Works of the Bethlehem Steel Company.

samples them automatically, and then they are distributed on a long pile, in even layers, by a high-speed automatic travelling tripper on an overhead belt conveyor. When the pile almost reaches its 5000-ton capacity, the general analysis is calculated from the weights and separate analyses taken, and calculations are made as to what the general charge needs in addition, to make it self-fluxing in the furnace. This is then added to the pile, and the coke fuel is spread on top of all. They then have a long pile of ore containing 5000 tons; and if an exact cross-section sample can be taken, its analysis will be exactly the average of the whole pile.

The Robins reclaiming machine advances, cutting an exact

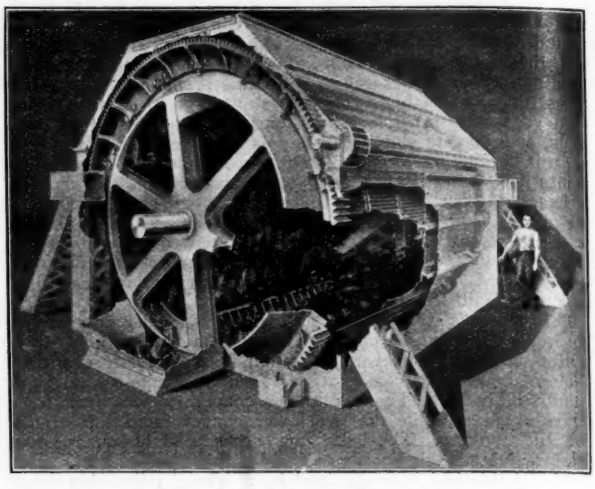


Fig. 3.—The Bradford Breaker.

cross-section from the pile at a high capacity, and discharging to a belt conveyor in a trench along one side of the pile. This conveyor takes the charge to the furnaces. Tests have been made by stopping the charging conveyor under load and removing all the ore on it for a certain length; and the analysis of this sample has been found to be exactly that of the whole pile, according to previous calculation. This method of proportioning furnace charge at these plants has greatly increased the capacity of the furnaces, reduced the necessary fuel by 30 p.ct., and greatly lowered costs.

The general methods of coal handling described in this article, as well as the Robins measuring coal mixer and other machines, were developed by the Robins Conveying Belt Company, who equipped the plants mentioned, as well as many others, with this system. Such plants are now completely designed, according to the Robins system, and made in England by the Fraser & Chalmers Engineering Works at Erith, Kent, who also make the Bradford breaker and the hammer mill pulverizer developed by the Pennsylvania Crusher Company, of Philadelphia.

COAL ASH AND CLEAN COAL.

By R. LESSING, Ph.D., F.C.S., M.I.Chem.E.

Abstract of the Third Cantor Lecture, delivered at the Royal Society of Arts on Dec. 7.

INFLUENCE OF THE MINERAL CONSTITUENTS ON THE UTILIZATION OF COAL.

CHEMICAL AND PHYSICAL BEHAVIOUR IN COMBUSTION PROCESSES.

In examining the behaviour of mineral matter during the burning of coal, it must be remembered that the course of the combustion process varies enormously from case to case. The depth of the fuel bed, the tightness or looseness of packing, the strength of chimney draught, the oxidizing or reducing atmosphere, the temperature at different points of the bed and at different stages of the combustion process, and many other factors influence the chemical reactions and physical changes which may take place in the ash constituents.

The factor first to be considered is the total amount of ash-forming matter in the coal. It determines the degree of accessibility of air to the combustible substance, and hence the throughput of fuel in a given time under otherwise equal conditions. The larger the percentage of ash, the greater is the risk of leaving unburnt coal or coke in it. Moreover, the sensible heat retained by the ash, though not affecting the heat balance very seriously—it being of the order of 0·4 p.ct. of the calorific value of a coal containing about 10 p.ct. of ash—is directly proportional to this percentage.

The factor next in importance, and one of a more fundamental character, is the chemical composition of the ash. It affects the different phases of the combustion process in various ways. The burning of coal may be roughly subdivided into several stages, which overlap and otherwise influence each other: (1) Carbonization; (2) the combustion of the gases and vapours thereby released, which may be accompanied or preceded by a secondary decomposition of these volatile compounds; (3) gasification of the carbon residue left after carbonization, by its conversion into carbon monoxide, and the burning of carbon monoxide to carbon dioxide. It is impossible by present means to isolate experimentally these different stages or even to determine their sequence with any degree of precision. It so happens, however, that every one of them is subject to the influence of catalysts, as will be shown later; and among the constituents of coal ash are elements which have been proved capable of catalytic activity.

An intimate knowledge of the composition of ash is of paramount importance in all problems connected with the combustion of coal; and many discrepancies observed in the practical utilization of otherwise similar fuels can be explained by their difference in ash percentage and composition.

FUSIBILITY OF COAL ASH.

The problem of the fusibility of coal ash has already attracted the attention of fuel technologists to a considerable extent, since liability to partial sintering or fusion causes clinker formation, and in consequence the restriction of air supply through fire bars and fuel bed, the envelopment of unburnt fuel in the fused or sintered ash portion, and the chemical attack of fire bars and refractories by the resultant corrosive slag—all undesirable phenomena feared by the combustion engineer. They make the determination of the melting and softening point of coal ash a necessary adjunct to the routine tests for the examination of coals.

The principles underlying the softening and melting of ash,

and the tests for determining the temperatures at which these physical changes take place, are the same as those applying to clays and ceramic materials in general. Fusibility depends largely upon chemical composition, and in the first instance upon the ratio of alumina to silica, which compounds, as in clay, are quantitatively the most important constituents of ordinary coal ash. According to this ratio in any given mixture, the melting-point of aluminium silicates or intimate mixtures of pure alumina and silica may vary from 2020° C. for alumina itself down to 1610° C. for the mixture of 13 p.ct. of alumina and 87 p.ct. of silica, rising again for the more silicious mixture until for pure silica it reaches 1770° C., which is also approximately the melting-point of $Al_2O_3,2SiO_2$—alumina and silica in the ratio obtaining in pure clay substance.

On adding bases which act as "fluxes" to an alumina-silica compound or mixture, the melting-point is considerably lowered. Richter postulated in 1868, and Bischof confirmed later, that molecularly equivalent quantities of the various bases lowered the melting-point to the same extent. Their assumption that, on fusing, the aluminium silicate combined with the fluxes to form double silicates had to give way to the modern physico-chemical conception of solid solutions, according to which, as in dilute aqueous solutions, an equal number of molecules of different compounds in equal concentration lowers the melting (or solidifying) point to an equal extent.

Of some practical importance in this respect is the difference in slagging effect between iron compounds in various stages of oxidation; for 72 parts of ferrous oxide lower the melting-point as much as 80 parts of ferric oxide. As iron is one of the main contributors to fusibility, the atmosphere in which it is raised to the material temperature is therefore an important factor determining the melting-point. Fieldner[1] and his collaborators, who have done a considerable amount of work on the melting-point of coal ash, showed that a reducing atmosphere of hydrogen and water vapour, or of carbon monoxide and dioxide, gives under suitable conditions melting or softening points as high as those obtained in an oxidizing atmosphere. They explain this apparent paradox by the reduction of ferric oxide beyond the ferrous oxide stage to metallic iron (melting-point about 1515° C.), but found by analyses of clinkers that reduction in ordinary boiler furnaces is arrested at the ferrous stage, resulting in maximum fusibility. They found that concordant results cannot be obtained in an oxidizing atmosphere if small proportions of reducing gases are present, nor in a reducing one if it contains any oxidizing gases.

An interesting point in their valuable researches is that melting-points in a CO-CO_2 atmosphere were generally somewhat higher than those obtained in an H_2-H_2O atmosphere. In explanation of this observation, I suggest that in an atmosphere of CO-CO_2 the carbon monoxide is liable to catalytic decomposition into carbon and carbon dioxide, and that the carbon either by itself or in form of carbide raises the refractoriness.

The term melting-point so far used does not apply to the heterogeneous mass which coal ash represents. Even the most finely subdivided and homogeneously mixed clay has no definite melting-point, but on being gradually heated passes through softening and fusing stages of varying range. In coal ash as obtained in practical fuel utilization the conditions are much more complicated on account of the irregular distribution of the ash and its different constituents over the lumps or particles constituting the bulk, and throughout the mass of each individual piece.

Let us imagine, for one moment, a mass of coal as charged on the grate of a boiler furnace to be devoid of combustible matter, but to be distributed in space as if the coal substance or its residual portion was still present. In other words, we visualize a combination of ash skeletons like those seen in the stereoscopic examination with the aid of X-rays. On exploring the chemical composition and distribution of these skeletons and their orientation to each other, we would find individual pieces to consist of grey layers of the highly refractory and comparatively dense clay base of durain, alternating with brownish laminæ of light, fluny, alkaline clarain and vitrain ash, separated and crossed by thin veins of calcite or ankerite, with lenticles of similar material mixed with clay, representing the fusain; crystals of pyrites would be found dotted over the whole mass or in forms of sheets like the veins of calcite. Fragments of shale or other stone may adhere to, or be enclosed in, the same pieces. The skeletons representing original pieces would, of course, differ from each other in structure and size, and be packed in an irregular arrangement. Moreover, loose pieces of shale, calcite, gypsum, pyrites, or other minerals would be present in their natural state and mixed with the skeletons from the coal proper.

On applying heat to this kaleidoscopic mass of "mineral space lattices," the individual components, having undergone the chemical changes involved in burning-off the coal substance, will behave as regards softening or fusion in the first instance as governed by their own composition. Thus, the alkaline portion of the clarain ash skeleton will sinter, or partially melt at fairly low temperatures, causing its own shrinkage, and splitting-off adjoining laminæ of durain. Ferrous sulphide resulting from the decomposition of pyrites (M.P. 1190° C.) and ferrous oxide (M.P. 1419° C.) from ankerite also soften at comparatively low temperatures. Once these metallic compounds approach their sintering stage, they become capable of reacting with others with which they are in contact, particularly with silica, which may be present in the free state or in clay, the products in their turn acting as solvents and slagging agents. The slag thus formed partially or completely envelopes particles of unburned coal substance, and prevents further access of air, and thus combustion. The high viscosity of these slags at, or even above, the temperature of their formation prevents them from running, and therefore localizes their action, unless an undue proportion of fluxes is present.

The picture presented by the final stage of combustion is that lumps of refractory clay from durain and of shale have retained approximately the shape of their original skeleton; the surfaces are covered by films of slag where the fusible ashes of clarain and vitrain, pyrites, and ankerites had access, while nodules or stalactites of slag or glass are formed in places where the latter materials were concentrated.

While thus a slag film of clarain ash or ankerite may not succeed in lowering the fire stability of a lump of durain ash burned to a highly refractory firebrick, an ash of the identical average chemical composition, if ground and intimately mixed, would behave in an entirely different manner in that the fluxes would have a more marked effect on the less fusible portions.

This emphasizes the importance attached to the study of the distribution of ash. It must not be inferred that these considerations make the melting-point test superfluous; they merely indicate that the values obtained by it should be used with as much caution as the results from the complete analysis of an averaged sample of coal ash.

Incidentally, it might be stated that the high alumina-silica content of durain is at least one factor apart from the combustible matter which makes coals high in durain suitable for steam raising. Indeed, Constam[2] suggested to add kaolin or quartz to coals having very fusible ashes, in order to raise their melting-point.

Size of particle is here again of the utmost importance; and as a general rule it may be expected that clinkering is promoted as the size decreases. The dust fired in powdered fuel plants would, therefore, most nearly approach the conditions of the melting-point tests where the ash is allowed to collect at a temperature beyond the permitted maximum. For this reason it has been found expedient to provide water-cooled screens against which the hot ash particles impinge and are cooled before the more fusible ones adhere to those of higher refractoriness.

While fusion of ash is generally avoided by the selection of coals or by special precautions, such as steaming, in the "slagging" type of gas producer it is actually induced by the addition of limestone or iron ore to the fuel bed, which is kept at very high temperatures. The advantages gained from these producers, which are not used to any extent in this country, are high rate of gasification and hence low capital outlay, avoidance of clinker removal, complete combustion of carbon and the use of coal or coke having low-melting ashes, which would give trouble in other types of producers or furnaces.

After discussing pan-ash cleaning, stating that the recovery of the large quantity of combustible matter usually left in the cinders from boiler plants, gas retort generators, &c., is a further proof of the need for a better preparation of the coal before use, by the improvement of existing washing or cleaning processes and their application to a greater tonnage of raw coal, Dr. Lessing went on to deal with the influence of the inorganic constituents on the carbonizing process.

Ash as Inert Matter.

In carbonization, as in the combustion of coal, the first and obvious function of the ash is that of a diluting impurity. In the carbonizing process the mineral matter acts similarly to sand, powdered coke, or electrode carbon as used in tests for agglutinating power, or to coke breeze as added to highly swelling coals for the purpose of bursting the bubbles formed in the "plastic layer." It reduces the strength of coke and causes the production of breeze or ballast, which are always higher in ash than the large coal, as is shown by the following ash percentages taken from an actual oven charge, which may be considered typical.

—	Yield.	Ash.
	P.Ct.	P.Ct.
Furnace coke (above 1½ in.)	62·8	9·5
Breeze (½ in. to ½ in.)	2·9	11·3
Ballast (below ½ in.)	2·9	17·4

A high ash percentage in the coal not only affects the coking process as an inert diluent, but it impairs the quality of the coke to an even greater extent. Gas coke usually contains more ash than oven coke, and its combustion efficiency is, as far as ash is concerned, and leaving other factors such as structure and carbon modifications out of consideration, considerably impaired. Moreover, the mere fact of its leaving a

[1] U.S. Bur. of Mines. Bull. 129, Bull. 209.

[2] "J. Gas Lighting," 1913, *124*, 522.

large incombustible, or, more correctly, unburnt residue, is a considerable drawback in connection with domestic uses.

INFLUENCE OF ASH COMPOSITION.

Our lack of knowledge of the chemical reactions which most inorganic compounds in coal undergo during carbonization, or even of the precise form in which the elements are combined in coal itself, renders a study of their effect on its thermal decomposition extremely difficult. In the carbonizing process, severely reducing conditions prevail, and some of the inorganic compounds formed from the mineral matter in coal, and present in the coke, are necessarily very different.

Incineration of coal leaves a residue which, apart from avoidable minor inclusions of carbonaceous matter, is entirely inorganic and ready for examination by the usual methods. The coke residue from carbonization, on the other hand, contains a large part of the mineral matter firmly embedded in the carbonaceous mass, and disintegration or very fine grinding is required to expose it for direct chemical examination. The results of this examination, such as treatment with acids or other reagents, is therefore dependent on the size of coke particle.

Some of the changes which inorganic compounds undergo during coking can be traced even after incineration, as is shown by the comparison in the following table of the ash of a coal and that of the coke made from it under controlled laboratory conditions at 900° C.

Yorkshire Coking Slack.

CLARAIN-VITRAIN FRACTION.

	In Coal.		In Coke.
Ash, p.ct. of coal	2·45	..	2·41
Analysis of—	Ash from Coal. P.Ct.		Ash from Coke. P.Ct.
Soluble in water	1·82	..	1·62
,, ,, HCl	42·54	..	35·98
Insoluble in HCl	55·64	..	62·40
Soluble in HCl (including soluble in water)—			
SiO_2	0·36	..	0·42
Al_2O_3	15·69	..	9·53
Fe_2O_3	22·99	..	22·83
CaO	0·90	..	1·52
MgO	0·30	..	0·27
Na_2O	1·29	..	0·98
SO_3	0·21	..	0·65
	41·74	..	36·20
Insoluble in HCl—			
SiO_2	42·16	..	43·14
Al_2O_3	10·76	..	18·16
Fe_2O_3	0·80	..	1·04
CaO	0·24	..	0·32
MgO	*Nil*	..	Trace
	53·96	..	62·66

The results show that a considerable portion of the alumina was rendered insoluble in hydrochloric acid during carbonization, while the iron remained unaffected. As the sample was ground to pass a 30-mesh screen, and was homogeneously mixed, the question of orientation of the ash components to each other did not arise—that is to say, the iron must be presumed to have been in close enough contact with silica to react with it, but did not do so, while the alumina formed an insoluble silicate.

Further work on similar lines is required to furnish proof for or against the hypothesis of a formation of iron silicide and iron carbide during carbonization—compounds which have been claimed to be responsible for the hardness of coke.

CATALYTIC INFLUENCE OF THE MINERAL CONSTITUENTS.

What, in my opinion, may be considered the most important function of mineral matter in the carbonization and, as has been indicated earlier, in the combustion of coal is its capacity of directing catalytically the course of thermal decomposition of organic matter. I feel some hesitation in pressing for the recognition of the part which mineral matter in coal, as well as retort, oven, or furnace material, plays by acting catalytically, since my endeavours during the last twelve years to carry conviction into the minds of practical gas engineers and coke oven men have met with disappointing response. The theory propounded in a William Young Memorial Lecture[3] in 1914—that at temperatures at which the molecular bonds of affinity of the coal components are several and the fragments reach their highest degree of activity, certain inorganic compounds must necessarily exert a catalytic influence on the reactions taking place—was based on general experience with catalysts similar to those in reactions contributing towards the complexity of the carbonizing mechanism. Such reactions are: Oxidation, reduction, dehydration, scission of molecules, polymerization, ring formation, hydrogenation, and dehydrogenation.

The catalytic effect of inorganic compounds was definitely established in subsequent work[4] on the carbonization of sugar, cellulose, and coal.

[3] "J. Gas Lighting," 1914, *127*, 570.

[4] Lessing and Banks, "J. Chem. Soc.," 1924, *125*, 2344.

The carbonizing results obtained with coal are shown in the following table:

Influence of Catalysts on the Carbonization of Coal at 900° C.

Clarain and Vitrain from Dalton Main.

Through 30-Mesh Sieve. HCl Extracted.

—	Coke, *less* Compound Formed.	Retort Carbon.	Tar.	Gas (c.c. per gm.).	Coke + Retort Carbon.	Tar + Retort Carbon.
	P.Ct.	P.Ct.	P.Ct.		P.Ct.	P.Ct.
$FeCl_3$	65·72	1·32	17·59	254	67·04	18·91
H_2SO_4	64·33	1·07	18·15	262	65·40	19·22
$FeSO_4$	64·04	1·94	20·85	256	65·98	22·79
Na_2SiO_3	63·69	1·09	20·12	249	64·78	21·21
Na_2CO_3	63·50	1·74	20·37	245	65·24	22·11
SiO_2	63·34	1·51	21·28	252	64·85	22·79
Al_2O_3	62·92	1·95	22·13	243	64·87	24·08
K_2CO_3	62·77	1·41	21·69	244	64·18	23·10
2NaCl	62·28	1·82	20·76	255	64·10	22·58
$\frac{1}{2}Fe_2O_3$	62·23	3·34	24·05	245	65·57	27·39
CaO	61·08	3·42	20·20	253	64·50	23·62
MgO	60·94	3·57	22·05	248	64·51	25·62
$(COONa)_2$	59·92	3·69	19·73	258	63·61	23·42
Na_2SO_4	57·62	5·34	26·17	269	62·96	31·51
Untreated	53·68	8·48	29·02	255	62·16	37·50

The directive influence of the catalysts upon the balance of solid residue and volatile products is of the utmost importance.

The mechanism of the reactions involved has not yet been explained, but the indications are that the various additions influence thermal decomposition, so as to bring about scission of the molecules at different points, with the result that not only the relative quantities are affected, but that the properties of the products, and particularly those of the coke, are varied both as regards chemical composition and physical character. Support has been given to the latter contention by more recent work[5] on similar lines, in which the coke obtained was analyzed for its ultimate composition.[6] As will be seen from some typical examples recorded in the following table, this varies very considerably.

Ultimate Analysis of Cokes.

Compound Added.	Carbonized at 600° C.		Carbonized at 900° C.	
	$Al_2(SO_4)_3$.	Untreated.	$FeCl_3$.	Untreated.
C	85·60	83·03	89·96	87·82
H	3·25	2·90	1·24	1·24
Ash	2·98	2·41	3·99	2·87
O + S + N	8·17	11·66	4·81	8·07
	100·00	100·00	100·00	100·00

The differences are still more interesting when expressed in percentage yields of carbon, hydrogen, and oxygen, and referred to the original coal, as shown in the following table.

Carbonized at 600° C.

Compound Added.	Coke.	Coke, *less* Compound Formed.	Carbon in Coke.	Hydrogen in Coke.	O + S + N in Coke.
$Al_2(SO_4)_3$	75·48	74·79	64·60	2·45	6·17
Untreated	69·71	69·71	57·80	2·02	8·13

Carbonized at 900°.

Compound Added.	Coke.	Coke, *less* Compound Formed.	Carbon in Coke.	Hydrogen in Coke.	O + S + N in Coke.
$FeCl_3$	65·38	64·68	58·82	0·81	3·14
Untreated	62·27	62·27	54·69	0·77	5·03

The results indicate that catalysts which increase the coke yield also tend to raise the carbon percentage in the coke obtained. A surprising result is that the oxygen content in the cokes, after making allowance for the possible total of sulphur and nitrogen included in the different values, varies very considerably—a fact which has an important bearing on the inflammability, reactivity, and combustibility of coke.

Recently some work has been done by others[6] on the influence, on carbonization, of inorganic compounds added to coal or of the composition of its ash; and the fact that such compounds have a decisive effect on the yield, distribution, and properties of the products, both in the primary decomposition of the coal and the secondary changes of the first products, can no longer be doubted.

INFLUENCE OF GASIFICATION OF COAL AND COKE IN PRODUCERS.

The influence of catalysts is not restricted to the purely thermal decomposition of coal at high or low temperature. It

[5] "J. Soc. Chem. Ind.," 1925, *44*, 345.

[6] Baehr, Stahl und Eisen, 1924, *44*, 1, 39.
Koppers, Stahl und Eisen, 1924, *44*, 691.
Marson and Cobb, "Gas J.," 1925, *171*, 39.
Kreulen, Chem. Weekblad, 1923, *20*, 553; 1924, *21*, 58; 1925, *22*, 476.

applies to the combustion process whether carried out to completion, as in industrial or commercial heating practice, or in the form of partial combustion in gas producers. In water gas and power gas making the addition of such substances as lime or iron ore has long been practised for the purpose of increasing the ammonia yield or influencing the water gas equilibrium or the composition of the final gas. Moreover, as has been said, the chemical and physical properties of the coke used in these processes depend on the amount and composition of the ash, which, therefore, predetermine the rate of gasification obtainable with different qualities.

Influence on Hydrogenation and Total Conversion into Oils.

The direct liquefaction of coal and semi-coke by hydrogenation under pressure has attained a considerable degree of scientific interest, if not of commercial importance. In the process as proposed and practised by Bergius, a certain amount of iron oxide is usually added to the coal charged into the autoclave, ostensibly for the purpose of binding sulphur. Bergius[7] recognizes that the inorganic constituents have an influence on the liquefaction of coal, and he points out that for their study, which in Germany had not yet received any considerable attention, the solid residue from hydrogenation will be of particular interest as it consists to a large extent, and sometimes exclusively, of the mineral compounds in their original state and unaffected by high-temperature reactions.

While Bergius does not regard the catalytic influence of inorganic substances as of practical importance, a number of other workers find that certain compounds may exert a profound catalytic effect upon hydrogenation of coal under high pressure, as, indeed, they do in the hydrogenation of fatty oils and hydrocarbons. Fischer[8] found that hydrogen without catalyst gave much poorer results than hydrogen in the presence of sodium carbonate.

The synthesis of liquid hydrocarbons and alcohol from water gas as carried out by the Badische Company and as suggested in Fischer's "Synthol" process is, of course, entirely based on catalysis; and in the manufacture of the water gas, used as raw material, the composition of the coke ash or its adjustment are of vital importance in determining the composition and efficiency of production of the gas.

Clean Coal of the Future.

In the gas industry, where coals of rather high ash percentage are used, a total throughput of mineral matter of about 1,800,000 tons per annum must be assumed. This implies that little less than the equivalent of the carbonizing capacity of the Gas Light and Coke Company is constantly employed, and a corresponding amount of retort fuel wasted, in the useless heating of inert matter which eventually forms the least desirable constituent of ordinary gas coke. To these economic shortcomings must be added the technical disadvantages of a high, or even what is to-day a normal, ash percentage. It is now an accepted fact that at least some ash constituents have a detrimental effect on the processes of coal utilization. As long as coal is used containing mineral matter, the nature of which is not known, the working results are influenced by this unknown, but in many cases decisive, factor. In order to give the directing mind of the modern fuel technologist full scope, he must have supplied to him a coal containing a minimum of extraneous matter, so that the working results are not left to the uncontrollable effects of these chance impurities, but are subject to tolerably exact prediction, possibly involving calculated and predetermined additions of necessary correctives.

Though it is never safe to prophesy, I make bold to suggest that within very few years the carbonizing industries, which are mainly concerned in the efficient recovery of the intrinsic value of coal, will feel constrained to insist for their raw material on coal containing only a fraction of the proportion of mineral matter which is customary to-day. I further believe that the provision of such a commodity will be technically possible and commercially profitable.

The subject of coal ash has not received in the past, and hardly receives to-day, the attention which its importance justifies. As an example of this neglect may be cited that at the recent conference on smokeless fuels, held at Sheffield, not one of those who contributed to the discussion deemed the influence of ash constituents on the carbonizing mechanism worthy of mention. Yet I am convinced that some of the results already obtained—for instance, on the catalytic behaviour of inorganic compounds—are sufficiently definite to show that a great deal of the research work on the carbonization of coal and other fuels is subject to considerable revision, as in most of this work the influence of the composition of the mineral matter, apart from its amount, was not considered. I hope to have convinced you that a close study of the valueless portion of coal is one of the urgent needs of fuel research, and that the results likely to be obtained from it will be of help in enhancing the value of our most vital source of energy—coal.

[7] Z. Ver. Deutsch. Ing., 1925, *69*, 1313, 1359.
[8] Fischer-Lessing, "The Conversion of Coal into Oils," p. 197.
[9] Fuel, 1925, *5*, 484.
[10] J. Soc. Chem. Ind., 1925, *44*, 942R.
[11] J. Soc. Chem. Ind., 1925, *44*, 507T.

Interest in the lectures was maintained throughout the series; the audiences on each occasion being both large and appreciative. The subject dealt with is, of course, one to which Dr. Lessing has devoted a tremendous amount of time and thought; and these three lengthy Cantor Lectures proved none too much to give his hearers a fair idea of his researches and their results. The story of coal is a fascinating one; and it lost none of its fascination at the hands of so practised a lecturer as Dr. Lessing.

At the first lecture, which covered the preliminary stages in the formation of coal, with special reference to the amount of ash contributed by its four main constituents, and the differences in the quantity and composition of the ash contained in them, a number of excellent coloured lantern slides were exhibited by Dr. Lessing to illustrate his remarks; and there were in the hall many specimens relating to the composition and distribution of inorganic compounds in coal. There was also a demonstration of the "Carboscope" which Messrs. Kemp, Thomson, and McLaren have devised for the examination of coal samples by X-rays.

Again at the second lecture there was a series of slides showing photographs of inorganic constituents of coal, coal dust explosions, and types of coal washers; and, what proved even more engrossing, two experiments were made. One of these was a typical elutriation experiment, showing the formation of slurry from the fusain and shale dust in raw coal. The black slurry overflowing made room, after a short time, for clear water, leaving the washed coals at the bottom of the washing vessel. While Dr. Lessing's assistant spoiled the appearance of his hand by contact with the raw coal, the lecturer himself demonstrated that the washed coal had no such effect—humorously remarking, while doing so: "My right hand does not know what my assistant's left hand does." As a matter of fact, with the removal of the fusain, the coal was rendered actually clean to the touch; fusain being the only constituent which soils the fingers.

The second experiment was a demonstration of Dr. Lessing's own process for mining coal by chemical means. A large block of coal, weighing several hundredweights, was treated with a gentle current of sulphur dioxide, led into the interior of the block through a narrow borehole. At the close of the lecture, there was an interval just sufficiently long—it could have been no more than a very few minutes—to give the audience time to speculate as to whether or not the experiment was going to be successful, and then, following some light taps, the big block was readily cleft along one of the planes containing ankerite.

Interest was fully maintained in the third lecture, at which, again, an absorbing array of specimen cases were on view. Quite early in this lecture, Dr. Lessing interested his audience in an experiment which he explained had long been regarded as a "parlour trick," but which possessed nevertheless a deep significance. He showed, in connection with the section dealing with catalysis, that a lump of sugar, when held in contact with a gas jet would not ignite, but merely melted. After, however, one end of the piece of sugar had been dipped in soda ash, the sugar burned with a yellow flame; and when another lump had been similarly placed in tobacco ash, it burned with a slightly bluish flame. In neither of these instances did it drip at all.

This lecture concluded the series; and at its termination the Chairman (Sir Thomas Holland, F.R.S., who is Chairman of the Council of the Society) said he felt sure that all present would agree with him that the standard of excellence which had always been associated with the Cantor Lectures had been fully maintained by Dr. Lessing. When the lectures were available in the "Journal" of the Society, there would no doubt be many questions they would like to ask Dr. Lessing, which might not occur to them at the moment. The value of the lectures lay not merely in the fact that Dr. Lessing had so freely given them the results of his own research work, but also in the fact that he had opened up a new set of ideas, and had indicated to his audience opportunities for research work for themselves. On behalf of the Council, members, and visitors, he tendered Dr. Lessing sincere thanks for the great amount of trouble to which he had put himself in the preparation and delivery of the lectures.

In response, Dr. Lessing emphasized the fact that a great deal more research was required. "In fact," he said, "the more I have worked on this subject, the more deeply have I realized how little we know about it." To indicate how old the problem was with which they were dealing, he exhibited a final lantern slide, showing a page from a book on elementary chemistry published in Holland in 1741. Dealing with coal, the author referred to the ashes it left behind when burnt, and said that "it might be of great service if an easy and cheap way were known of extracting the oil out of common coal." In view of this, Dr. Lessing declared, "we really should confess ourselves ashamed at not having got any further with the matter than we have done."

SENSIBLE HEAT DISTILLATION.

Description and Working Results of the "L. & N." Plant at Barugh.

Recently, thanks to the courtesy of Mr. Harald Nielsen, we had the privilege of inspecting a highly interesting plant installed at Barugh, near Barnsley, by Sensible Heat Distillation, Ltd. ("L. & N." Process), of 100, Victoria Street, S.W. 1. Mr. Nielsen explained that the plant, which is in charge of Messrs. C. Hamilton Foott, B.Sc., and G. S. Haslam, Ph.D., B.Sc., is usely solely as a demonstration unit for testing various kinds of carbonaceous material—from caking and non-caking coals and lignites to town sewage. The quantity of any particular material tested is generally not less than 25 tons, so that a large-scale run extending over at least three days is obtained for each sample. It is, of course, necessary that the plant should be suitable for treating these various grades of substance; and consequently adjustments are arranged so that a material can be studied under different conditions, and the set of conditions determined which will serve as a basis for designing a plant specially adapted for that particular material.

The Retort.

The retort itself consists of a firebrick lined cylinder about 45 ft. long and 3 ft. outside diameter. It is slightly inclined, and can be made to revolve at any desired speed from one revolution per two minutes to two revolutions per minute. The coal is fed continuously into the retort from an overhead bunker and, due to the inclination and the rotation of the retort, travels slowly to the discharge end, meeting on its way a hot gaseous distilling medium. This distilling medium can be, first, products obtained from the combustion of producer gas with secondary air; secondly, straight non-combusted producer gas carrying the sensible heat due to the gas reaction; thirdly, superheated water gas; and fourthly, a re-heated circulating gas. It is therefore essential that all these methods should be arranged for; and consequently the heating arrangements in the demonstration plant at Barugh look rather complicated.

Heating Arrangements.

The heating arrangements depend entirely upon what the final products are going to be and what the raw material is like. For town-gas works, for instance, where the problem is to produce a gas to serve as a diluent, superheated water gas will be used as a distilling medium; the blow gas being utilized for raising the temperature of refractory chequer-bricks in a heat interchanger. The products of combustion could afterwards be used in a superimposed coal drier and preheater. The water gas, which is heated in the heat interchanger placed in the circuit, may then be circulated through the retort as often as desired, picking up on its way the distillation gas from the coal itself, and thereby being enriched to any desirable extent. The surplus gas can be removed from the system from time to time, and the deficit made up by a fresh admission of water gas.

The convenience of this arrangement will at once be clear, as the water gas plant can be run to the best of its efficiency without interfering in any way with the distillation part of the process. Furthermore, the distillation can be effected and controlled entirely independently of the water gas producer, so that, by proper manipulation, the optimum conditions can always be attained. This, of course, is impossible in a vertical internally-heated retort superimposed on a water gas producer.

When using a circulating gas, the chequer brickwork may be heated by an independently worked gas producer. The products of combustion, after leaving the chequer brickwork, may also be utilized for drying and preheating the raw coal. This preheating arrangement, though not installed at the plant at Barugh, is one which will be incorporated in any large-scale unit erected hereafter, as evidence has been obtained regarding the tremendously important part played by the moisture in the raw coal. For instance, it has been found that when the moisture in the raw coal amounts to about 10 p.ct., nearly twice the amount of heat is required for carbonizing than would be necessary if the coal contained only from 1 to 2 p.ct. Again, when the question arises of dealing with a strongly-caking inferior small slack, the preheating arrangement enables one to oxidize the coke binder to any desired extent—in fact to destroy this binder totally, if a coherent coke is not required. The importance of this will also be clear; and it may be mentioned that this point is attracting the earnest attention of the Fuel Department of the Sheffield University.

The method of using a straight uncombusted producer gas for distillation comes into operation when a gas of a grade higher than that of ordinary producer gas is required, either for furnace work or for the firing of retort settings. Flame temperatures can be obtained with a cold clean producer gas of (say) 180 to 200 B.Th.U. which are considerably in excess of those at present obtained by hot straight producer gas fired with preheated air.

From what has already been said, it will be clear that the plant is extremely flexible, and permits the most interesting work to be carried out on practically every kind of fuel.

Condensation of Oils.

The temperature of the distilling medium entering the retort is generally about 650° to 700° C., and it leaves the retort at temperatures not below 150° C. It has been found that the temperatures of the coal itself are from 100° to 120° C. below these temperatures. On leaving the retort, the gas carrying the distillation products enters a dust cyclone, where the dust is separated-out without any of the tar condensing. This phenomenon is due to the lowering in vapour tension due to the large volume of gas employed. After leaving the cyclone, the gas enters two annular air-cooled condensers, where some of the very heavy and high-boiling fractions are condensed out. The temperature of the gas is so adjusted that the greatest amount of oil is carried forward into the water-tube condensers and a boosting fan, which latter acts as a highly-efficient oil separator. Leaving these, the gas passes through a "P. & A." tar separator, a final water-tube condenser, and two scrubbing towers, through which wash oil can be circulated.

The gas, after being freed from its liquid products, can be recirculated, or conducted to wherever it is wanted.

It has been found that, by the above system, and by entirely avoiding shock cooling, no tar emulsions are formed, and that the dry dust separation is so efficient that very rarely do the insoluble matters in the oil exceed 1 to 1¼ p.ct. It is well known that emulsion trouble is caused by a nucleus of dust and heavy pitchy tar in conjunction with water. When these nuclei are removed before the lighter oil condenses out, no trouble is experienced.

Measuring Arrangements.

Throughout the plant arrangements are made for the accurate measuring of volumes of gases at every desired point; the method employed being based on Prof. Prandtl's (of Gottingen) latest work on diaphragm measurements. A highly sensitive water-gauge manufactured by the Askania Werke is used in conjunction with this. The gauge reads accurately up to ¼ mm. water-gauge, and tests have shown that this measuring method is exact to within *plus* or *minus* 2 p.ct.

An arrangement is also made for by-passing a small amount of the gas, and using active-carbon adsorption for determining the amount of spirits in the gas.

Results of Tests.

The following figures are based on a series of tests carried out on Barnsley Bed coking smalls:

Barnsley Bed Coking Slack.

Raw Coal.

—	Proximate Analysis.	Ash and Moisture Free.
	P.Ct.	P.Ct.
Moisture	4·33	..
Volatile matter	32·77	36·95
Fixed carbon	55·78	63·05
Ash	7·12	..
	100·00	100·00

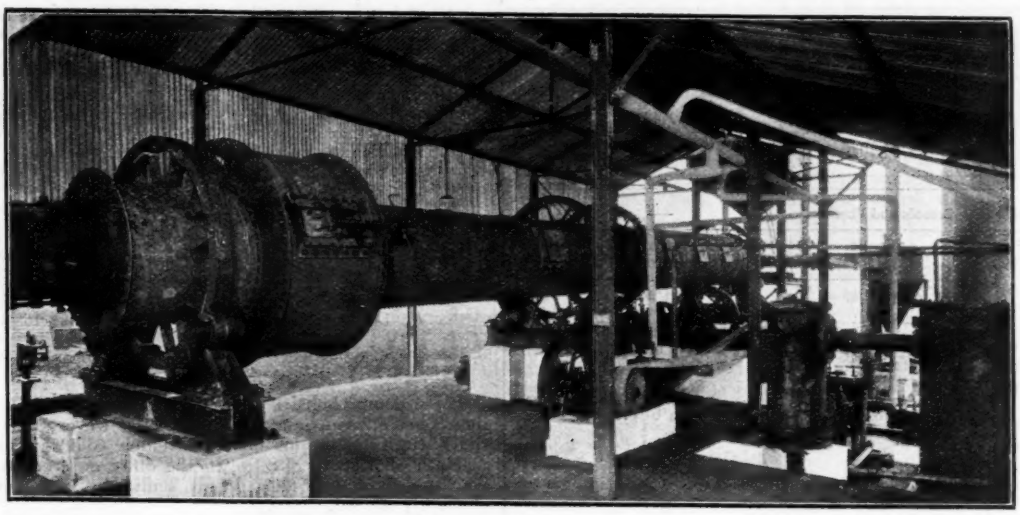
—	Ultimate Analysis on Dry Basis.	Ash and Moisture Free.
	P.Ct.	P.Ct.
Carbon	78·21	84·93
Hydrogen	4·71	5·11
Oxygen	6·89	7·45
Sulphur	0·98	1·06
Nitrogen	1·34	1·45
Ash	7·87	..
	100·00	100·00

Calorific Value:
B.Th.U. per lb., 13,000 (dry basis).
$\frac{C}{H}$ ratio = 16·6

YIELDS PER TON.

Raw Coal.

—	—	Ash and Moisture Free
Semi-coke	0·705 tons	..
Oil	17·5 galls.	19·75 galls.
Gas	3360 c.ft.	3790 c.ft.



VIEW SHOWING ROTARY RETORT, "L. & N." PROCESS.

SEMI-COKE.

—	Proximate Analysis.	Ash and Moisture Free.
	P.Ct.	P.Ct.
Moisture	*Nil*	..
Volatile matter	10·15	11·14
Fixed carbon	80·95	88·86
Ash	8·90	..
	100·00	100·00

—	Ultimate Analysis on Dry Basis.	Ash and Moisture Free.
	P.Ct.	P.Ct.
Carbon	81·66	89·61
Hydrogen	2·80	3·08
Oxygen	3·61	3·96
Sulphur	1·47	1·62
Nitrogen	1·58	1·73
Ash	8·88	..
	100·00	100·00

Calorific Value:
B.Th.U. per lb., 12,200.
$\frac{C}{H}$ ratio = 29·1.

OIL.

From condensers . . . . . 92·6 p.ct. = 16·20 galls.
From gas scrubbing . . . . 7·4 ,, = 1 30 ,,

STANDARD FRACTIONATION OF CONDENSER OIL (ENGLER).

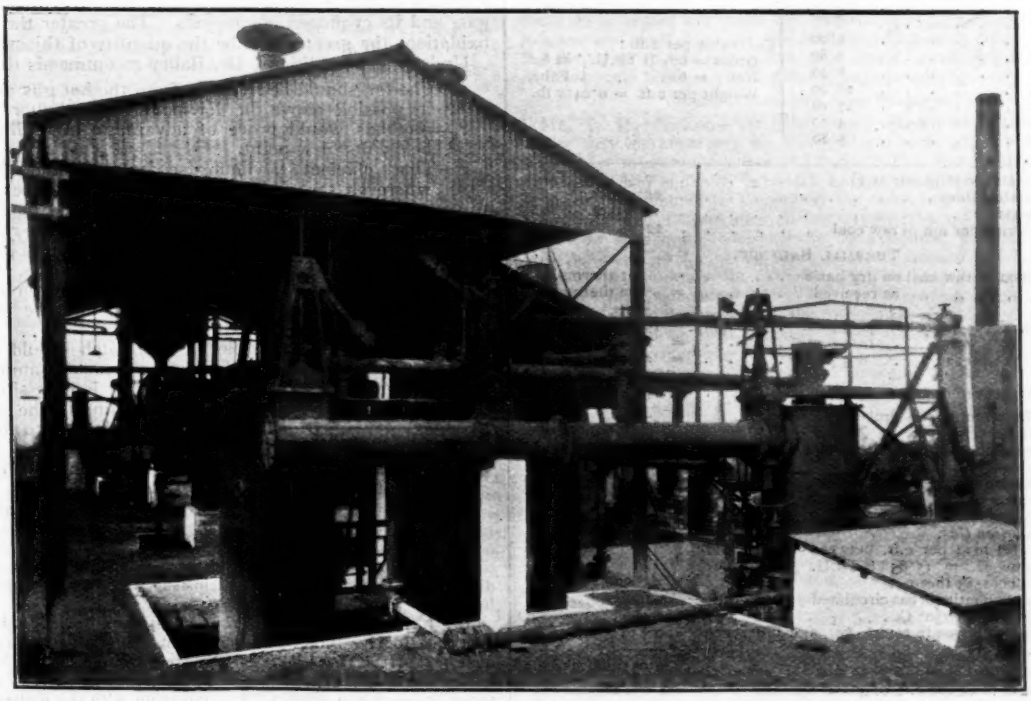
Fractions.	P.Ct. by Weight.	Sp. Gravity.
0° to 170° C.	0·3	0·860
170° ,, 230° C.	13·1	0·945
230° ,, 270° C.	19 5	0·977
270° ,, 360° C.	31·2	0·987
360° ,, 400° C.	18·5	1 026
Pitch coke	15·2	..
Oil from gas scrubbers	..	0·8220

Water in crude oil after 24 hours settling 3·3 to 5·5 p.ct.
Tar acids in crude oil . . . . . 42 p.ct.
Sulphur ,, ,, ,, ... 0·32 p.ct.
Calorific value . . . . . 15,600 B.Th.U. per lb.
Flash-point of Diesel fraction 270° to 300° C. . . . . 195° Fahr.

The percentage of chloroform-insoluble matter in crude oil (dust carried over), consisting principally of coal and producer dust, = 1 to 1·2 p.ct.

FRACTIONATION (100° C. JUMP) CRUDE OIL.

Fractions.	P.Ct. by Weight.	—
0° to 200° C.	3·0	Total anhydrous oil = 16·0 galls.
200° ,, 300° C.	38·0	
300° ,, 400° C.	43·0	
Pitch coke	16 0	



VIEW SHOWING WATER GAS PRODUCER AND REGENERATOR.

Neutral Oils.	Quantities.	P.Ct. on Anh. Crude Oil.
0° to 200° C. .	0·5 galls.	3·12
200° ,, 250° C. .	0·7 ,,	4·36
250° ,, 300° C. .	1·2 ,,	7·50
300° ,, 400° C. .	3·1 ,,	19·42
	5·5 galls.	34·4

Tar Acids.	Cresols and Phenols.	—
200° to 300° C. .	2·9 galls.	18·15
300° ,, 400° C. .	2·4 ,,	15·05
	5·3 galls.	33·20

Paraffin Wax.		
Soft, 40 p.c. . .	1·2 lbs.	
Hard, 60 p.c. .	1·8 lbs.	
	3·0 lbs. = 0·32 galls.	= 2·0 p.c.
Pyridine and homologues . . .	0·15 galls.	= 0·94 p.c.
Pitch coke . . .	16 p.c. by weight	= 25 lbs.
Refining losses .	2·4 galls.	= 15 p.c.

N.P.L. TESTS.

The heavy lubricating fraction from 330° to 400° C. was further refined, and thereby reduced in volume to 2·5 gallons. The viscosity at 70° Fahr. for 50 c.c. was found to be 1030 Redwood seconds. It was subsequently tested at the National Physical Laboratory at Teddington for lubricating properties, and was found to have a static coefficient of friction ranging from 0·114 to 0·118 at 19·8° C. at pressures ranging from 20 to 120 lbs. per sq. in. No decomposition takes place in this oil up to 400° to 420° C.

It might be mentioned that a well-known and widely-used heavy lubricating oil for internal combustion engines was tested in comparison with the above oil, and was found to have a static coefficient of friction ranging from 0·126 to 0·131 under the same conditions. The viscosity of this latter oil is 1800 Redwood seconds at 70° Fahr.

The light lubrication fraction boiling from 300° to 310° C. has every appearance of being identical with a good-class velocity spindle oil.

VAPOUR PRESSURE AND INTERNAL HEATING.

All the above oils are of the paraffin series; and the high percentage of heavy lubricating fractions—nearly 20 p.c. of the crude oils—is essentially due to the fact that the oils have been obtained without being in any way subjected to cracking, and, in fact, set free at temperatures below their initial boiling-point, owing to the large volume of distilling gas lowering the vapour pressure of the oils. By carefully-conducted low-temperature distillation by external heat, generally speaking not more than from 4 to 5 p.c. of the crude oil is obtained as a lubricating oil, if any at all. The main difference between the oils from the two different methods is thus evident. The oils produced by properly-controlled internal heating opens out a wide and promising field for research work on a large scale, as it appears that by this method an oil can be produced which can properly take the place of imported well oil.

GAS PRODUCED.

	P.Ct.	
CO_2	5·20	Cal. value per c.ft.: Gross = 675 B.Th.U. at 60° Fahr. Net = 610 ,, Weight per c.ft. = 0·0422 lb.
H_2S		
C_mH_n	2·00	
O_2	0·80	
CO	8·40	
H_2	26·40	
CH_4	47·20	
C_2H_6	4·20	
N_2 ÷ Loss	5·80	

Specific gravity (air = 1)	0·56
Combustibles	88·2 p.ct.
Inerts	11·8 p.ct.
Therms per ton of raw coal	22·7

THERMAL BALANCE.

Total heat in raw coal on dry basis	=	291 therms.
,, ,, ,, ,, as received	=	272 therms.
Recovered as semi-coke 70·5 p.ct.	=	191·3 therms.
,, ,, oil 10·4 p.ct.	=	28·4 ,,
,, ,, gas 8·3 p.ct.	=	22·7 ,,
Total recovered, gross 89·2 p.ct.	=	242·4 therms.
Heat Requirements in Process—		
Moisture—4·33 p.ct.		
Heating, evaporation, and superheating.	=	1·175 therms.
Semi-Coke—70·5 p.ct.		
Leaving at 550° C.	=	4·025 ,,
Oil—10·4 p.ct.		
Heat of formation, &c.	=	0·925 ,,
Distillation Gas.		
Useful heat per c.ft. between 650° C. and 150° C. = 15·85 B.Th.U. per c.ft. = 0·0001585 therm.		
Total quantity of gas circulated = 44,000 c.ft., leaving at 150° C.	=	2·080 ,,
Radiation losses in retort, &c., and difference	=	0·849 ,,
		9·054 therms.
Total heat in 44,000 c.ft. of gas at 650° C.	=	9·054 therms.

This heat was provided by gasifying coke in a gas producer and combusting the producer gas with secondary air. The over-all efficiency of the combustion is 50 p.ct. Hence therms required as coke = $\frac{9·054 \times 100}{50}$ = 18·1 therms = 6·64 p.ct. The net heat recovery is, therefore, 242·4 − 18·1 therms = 224·3 therms, or 82·56 p.ct.

In actual practice, using a gas-works coke in the producer, containing 12 p.ct. of moisture and 15 p.ct. of ash, the weight of the producer fuel on the raw coal as fed into the retort was 8 to 8·2 p.ct., which figure, when allowing for the excess moisture, corresponds very closely to the 6·64 p.ct. mentioned (18·4 therms).

WEIGHT BALANCE.

	P.Ct. by Weight.
Semi-coke	70·50
Oil	8·25
Gas	6·37
Original moisture	4·33
Liquor and loss	10·55
Total	100·00

These comprehensive figures leave little to add. It may be mentioned in concluding this article, however, that we visited the Barugh installation on an extremely cold day, and that the warmth of a semi-coke fire in the office adjacent to the plant was greatly appreciated. This semi-coke was burning very efficiently indeed.

EFFLUENTS FROM AMMONIA PLANTS.

By Dr. T. LEWIS BAILEY, F.I.C. (Chief Inspector of Alkali, &c., Works).

[Before the Midland Association, Nov. 26.]

The paper was on the lines of the one which he read before the Institution of Chemical Engineers at Leeds in July last. [See "JOURNAL" for Aug. 12, p. 385.]

The author traced the origin of the most noxious impurities, by going back to the production of the ammoniacal liquor itself from the crude coal gas; and, as a result of this, he was forced to the conclusion that it was advisable so to modify the methods of treatment of the crude gas as to obtain an ammoniacal liquor considerably less charged with noxious impurities than that obtained under prevailing conditions. Suggestions were put forward whereby it seemed reasonably possible to effect this economically, and at the same time to reduce the total amount of liquor produced. Reference was made to the definite suggestions of Dr. E. W. Smith and Mr. T. Campbell Finlayson in this direction in the paper they recently read at Newcastle-on-Tyne. (See "JOURNAL" for Nov. 11, p. 355.)

It will be remembered that Dr. Bailey, in his paper before the Institution of Chemical Engineers, reviewed the conditions under which gas liquor is produced, and indicated the constituents, including phenols and thiocyanates, which give trouble when present in the effluents from sulphate stills. Broadly speaking, the presence of phenols in these liquors is due to the intimate contact between tars and gas liquor, during condensation, circulation, and storage. The presence of thiocyanates is due to the interaction of the oxygen content of the gas, and its cyanogen compounds. The greater the chance for oxidation, the greater will be the quantity of thiocyanates.

Under these conditions, Dr. Bailey recommends that:

1.—The tar should be removed from the hot gas as efficiently as possible above the dew-point of the liquor, and shock methods would prove of advantage in cooling the gas below its dew-point.

2.—That efficient tar-liquor separators should be utilized wherever tar and liquor are found together, and that separate wells should be kept for tar and liquor.

3.—That through better conditions of pull in the retort house, and by the elimination of the introduction of air for purification purposes, prior to the condensers, the opportunities for the oxidation of the cyanogen compounds should be reduced to a minimum, and the liquor wells should be kept covered.

4.—That wherever possible an acid catch should be utilized for the extraction of the last 40 grains of ammonia from the gas. The rigid scrubbing that is necessitated in the attempt to extract the last 40 grains in the presence of oxygen is a fruitful source of trouble, due to the presence of thiocyanates.

5.—Circulation of liquor should be completely eliminated, except where the liquor contains nothing but fixed ammonia, and is used hot in the hydraulic main.

Discussion.

The PRESIDENT remarked that there was ample scope for a good discussion of the interesting and instructive paper to which they had listened.

Mr. J. FERGUSON BELL (Derby) said they all owed a deep debt of gratitude to Dr. Bailey for the valuable investigation work he had done. ["Hear, hear."] They were favoured in the Midlands by having the Chief Inspector under the Alkali Works Act to give them a paper on so vital a subject. In connection with the matter, he would like also to draw the attention of the members to the valuable reports

which were issued annually by the Chief Inspector. The last three reports contained a great amount of useful information; and he hoped that every member who had not already done so would get copies and study them carefully, and afterwards hand them on to their assistants or chemists, so that they in turn might profit from the information contained in them. In addition to this, with last year's "Proceedings of the Institution of Gas Engineers" was bound up a thesis by Mr. P. C. Gardiner on "The Purification of Sulphate Plant Effluent," which was well worthy of attentive perusal. Personally, he thought the main point Dr. Bailey had brought out was the necessity of looking into their cooling and washing processes. He had shown how desirable it was that the liquor and the tar should, as far as possible, be kept separate, in order that phenol might not be absorbed. Other points of great importance were that ammoniacal liquor should be worked-up as soon as practicable, and that the gas from the retorts should not contain a large proportion of oxygen. Dr. Bailey put the free oxygen at 0·3 p.ct. This was a figure that they would all of them do well to aim at. Of course, it was necessary to have a certain amount of free oxygen for purification purposes.

FOLLY OF PRODUCING BAD LIQUOR.

Their attention had been drawn by Dr. Bailey to the folly of producing a bad liquor, and then having to go to considerable expense to purify the effluent, so that the local authorities could take it into their sewers. His own experience pointed to the necessity of having ample storage accommodation to deal with effluent liquor, in order that the lime and other matters in suspension might be eliminated. The liquor should be cooled, and it should, he thought, be passed through some kind of filter, to make sure that there remained in it no suspended matter to which the local authorities could reasonably take objection. There was no doubt that since the introduction of vertical retorts the difficulties of dealing with effluent liquor had been on the increase. The local authorities had continually growing volumes of sewage to cope with, and therefore they did not want gas-works to dilute their liquor, but rather to reduce the bulk. It would, he felt sure, be well worth while for gas managers to consider whether they should not introduce some form of acid washer, whereby they would be able to reduce the volume of effluent liquors by at least one-half. The author had also made a point of the fact that, where they circulated their liquor, they should not circulate the whole of it through the mains, but some portion only. Of course, the three ingredients that they should reduce to the lowest possible limits were phenol, thiosulphate, and thiocyanate; and to do this, some form of treatment was necessary. He thought that they, as engineers, were in duty bound to do all they could to see that the liquor was, in quality and bulk, acceptable, as far as possible, to the local authorities; and to aid them in this they were very fortunate in having gentlemen of high technical attainments, like Dr. Bailey, who were willing to assist them in every way. He (Mr. Bell) was old enough to remember a great number of Inspectors under the Alkali Act in connection with different works of which he had had charge; and they had always been friends of his. He had invariably been pleased to see the Inspector—and why? Because he did not come to find fault, but to show the gas engineer how he could do his work better. They owed very much indeed to the efficient and helpful manner in which this Act had been put into force; and he would like to express the gratitude of the members to Dr. Bailey and his assistants. ["Hear, hear."] He knew that at works with which he was connected, either directly or indirectly, he had only to ask the District Inspector or to communicate with the Chief Inspector, in order to get all the help that he might need. It did seem that one of the difficulties in connection with vertical retorts was the ammoniacal liquor; but he felt sure that, if only the members would co-operate with the Chief Inspector and the District Inspectors, they would be able to overcome this trouble. In any case, the devil liquor ought to be treated separately, and should not be mixed with the effluent from the wells. For many years he himself had followed this course. Whether bacteriological treatment in gas-works on the lines laid down by Mr. Gardiner in the thesis to which he had already referred would prove too expensive, he did not know; but at any rate the proposal was well worth looking into. It must be remembered that gas undertakings could not afford to spend a great deal of money at the present time in purifying these liquors, in view of the low prices obtainable for sulphate of ammonia. Therefore any process they might introduce must not be too expensive. He proposed that the best thanks of the meeting be accorded Dr. Bailey for his kindness in coming and giving the Association the benefit of his wide experience.

GET BACK TO THE OLD CONDITIONS.

Mr. H. DAVIES (Chesterfield) expressed the opinion that what they had got to do was to get back to the old conditions. He remembered when he served his time that in the construction of a new works the engineer was extremely careful to make proper preparation for the separation at an early stage of the tar and ammoniacal liquor. In later life, however, he had come across cases in which this course had not been adopted. Years ago an engineer took care to cover up all places where liquor might come in contact with the air; and at the present time they could not do better than follow this example. He had known works which had been turning effluent into the sewers for a great number of years without any apparent difficulty, but where recently, due to the reconstruction of the sewage plant, it had become essential that the gas undertaking should take steps to treat this effluent before it passed into the sewers. In connection with one works, where the bacterial method had given place to a more modern arrangement, the difficulties were assuming serious proportions.

IMPORTANCE OF SEPARATION.

Mr. P. N. LANGFORD (Coventry) said that the paper dealt most ably with a subject which was at the present time exercising the minds of a great number of gas engineers up and down the country. The suggestions put forward for making the liquor purer, rather than having to treat it at a later stage, would be most helpful. With regard to the treatment of devil liquor, he might say that he had experienced difficulty some time ago, and Dr. Bailey advised him to adopt a certain process, which was subsequently put into operation, with the result that the oxygen factor in the effluent discharged into the sewer had been reduced by from 20 to 30 p.ct. They had still what he believed Dr. Bailey would describe as a "rotten effluent;" and he thought one of the factors that had occasioned the trouble was this question of the separation of the tar in the early stages, and storing it in tanks apart from the liquor. Only that morning, he had the temperature taken of the liquor in the storage wells, and found it was 108° Fahr. This, it must be remembered, was at a very cold period of the year; in the summer the temperature reached 120° Fahr. Absorption of the tar acids by the liquor with plenty of free ammonia present must be very rapid, particularly with such a temperature as he had mentioned. He had been interested in hearing the author say that the fixing of an acid washer on the outlet of the scrubber would result in a very much reduced quantity of effluent, and also that the effluent would be purer by so doing. A point to which he had had his attention drawn by Dr. Bailey was in relation to the liquor that condensed in the purifiers. Probably it was the general practice for this liquor to run back to the liquor storage tanks. He had some of it tested, and was surprised to find the oxygen figure 3400 parts per 100,000. Now he had taken this liquor away, and was using it for circulation through the cyanide purifiers.

Mr. R. S. RAMSDEN (Leamington) expressed, as others had done, the indebtedness of his undertaking to Dr. Bailey and his assistant, Mr. Carter, for the help they had given in connection with the treatment of effluent liquors. They began to have difficulties very soon after they started their sulphate plant. However, they consulted Dr. Bailey, and he had recommended certain modifications from which benefit had been derived. Additional experiments were now being carried out, which he hoped would assist them to improve their effluent still further.

USEFULNESS OF THE ACID WASHER.

Mr. W. A. TWINE (Birmingham) recalled the time when a visit from the Alkali Inspector "put the breeze up" everybody; but that was long ago. It was refreshing to think that they had in the paper that day, and in the very concise reports issued from time to time, such valuable help. It was the bounden duty of every gas engineer to "read, mark, learn, and inwardly digest" the contents of these reports. Reading those of the past three years could not fail to have brought them up against their problems, and to have induced them to try and improve their gas liquor. There was not the slightest doubt that if they kept the tar and liquor separated, the first step in this direction had been accomplished. The second, he thought, was with regard to the acid washer. He was perfectly certain—he was certain twelve years ago, and more so to-day—that acid washing had got to come. They had to take a lesson from the coke-oven people and from the chemical manufacturers. With the Mond plant at Saltley they were circulating liquor which at its maximum amount did not exceed 3 p.ct. of acid. He knew perfectly well that for the last ten or twenty years they had had before them the "bogey" of acid going forward into the purifiers; but the wonderful brains of the gas industry could surely overcome this trouble. He felt that, had they adopted acid washing twelve years ago, the losses, which were very small even in those days, would have been a good deal smaller still. He looked forward to the day—and it was not far distant, he hoped—when engineers would be able to make a stronger liquor. This would mean a great deal. He was not quite sure that he agreed with the statement which had been made about 50 p.ct. of steam being used. It seemed to him that an engineer who made sulphate, and whose 100 gallons of liquor became 150 gallons of effluent, was a very extravagant engineer, and should see what he could do to reduce his steam bill. He thought 33 p.ct. of steam was a figure one could work to. In fact, he had seen it done. By keeping the steam as low as possible, they would be reducing the quantity of those toxic bodies troubling the sewage people.

MORE REGARDING ACID WASHING.

Mr. T. H. POULSON (Stafford) also recorded his thanks to Dr. Bailey and his assistants for the kindness with which they had received him on many occasions in London. They had invariably helped him out of any difficulty in which he had found himself. It might interest the members to know that for some two years they had at his works been taking tests on the oxygen absorption figure. This had been done quite independently by a London firm in connection with activated sludge. For years past the sewage had been treated by bacteria; and now the activated sludge system had been adopted, and the Gas Department had come to the conclusion that they had got to do something to reduce the oxygen absorption by the effluents. It had been found, over a period of six months, when working the sulphate plant roughly a fortnight on and a fortnight off, that while the plant worked the oxygen figure was just double in the sewage effluent. The figure when the sulphate plant was not on was 11 parts per 100,000, whereas when the plant was on the figure was 23 parts per 100,000. At the Ministry of Health inquiry in connection with the loan for this activated sludge system, the Inspector made a very strong point of this liquor effluent, and wanted to know what was going to be done with it. He (the Inspector) thought that the Ministry of Health would only grant a loan conditional upon the Gas Department putting balancing tanks down, so as to have a steady flow of this liquor effluent over the twelve months. Fortunately they had an old gasholder tank, which they had been able to use for this purpose. In order to reduce the charges on the town, the Gas Department had been going into the matter, and had come to the conclusion that the first thing to do was to instal an acid washer. The whole plant, complete with acid storage tank, and so on, would not be very costly—roughly, £2000, as against £20,000 if additional area had to be provided at the sewage works for further activating—and the Gas Department thought this would be the better plan to adopt, because it was going to be cheaper for the town generally. Regarding acid

washing, he did not think any trouble would be experienced through acid being carried over, because at a works which he had visited, and which had been acid washing for some time—not with the reduction of oxygen in view, but merely for saving of steam, labour, and so forth—there was no trouble in the purifiers. All that was necessary was to connect a 1 in. to 1½ in. pipe between the inlet and the outlet of the washer, thus allowing a little crude gas to go forward. At the next meeting of his Committee, he proposed to bring this matter up, and to recommend that an acid washer, &c., be installed at his works. One point which rather worried him was in connection with the devil liquor. They certainly would make a devil liquor, even with acid washing, and he would like to ask Dr. Bailey whether he would expect, when using acid washing, the devil liquor of the condensers, and so forth, to have a very high absorption figure. Personally, he did not think it should be much higher than at present.

Mr. C. F. W. RENDLE (Redditch) thought it would be as well to consider the possible effects on other parts of the gas manufacturing process of adopting some of the suggestions that Dr. Bailey had put forward. Shock cooling of hot gas, for instance, it seemed to him, might not be without its effect on the resultant gas, although it might do something to reduce the oxygen absorbing constituents of the liquor. As to circulation of liquor and its evils, did Dr. Bailey mean it was inadvisable to circulate liquor even through appliances other than hydraulic mains?

MAKE THE BEST POSSIBLE LIQUOR.

Dr. E. W. SMITH (London) thanked Dr. Bailey for all the help he had given to the gas industry. He was always extraordinarily helpful. If gas engineers found it necessary to use oxygen for purification, it was at any rate not essential that it should be put in at the inlet to the condensers. It was much better to put it in as a measured quantity at the inlet to the purifiers. A good deal of this oxygen was there, however, not by deliberate putting in at any point of the plant, but in the wrong belief that it was always necessary to work with a pull, in order to get the maximum number of therms. His firm conviction was that it was a wrong principle to adopt for any carbonizing plant; and therefore it was not necessary at all, in a properly running works, to have any oxygen in the off-take pipes in the retort house. Two points which it was vitally important should be kept in mind were: First, that the best possible liquor should be made. Secondly, it was no use going to the expense of adopting activated sludge methods if at the same time the very best was not being done to reduce the trouble with the liquor; and means could, and would, be adopted for getting rid of this trouble. It should be the view of the Ministry of Health, he thought, that local authorities should regard the effluents coming from gas-works as being public service effluents; and subject to those responsible having done the best they could, the local authorities must be prepared to receive the effluents, whatever the colour was. Where new bacteria beds were being put down, it must be assumed that they would have to deal with public service effluents that were no worse than they need be. He would like engineers who knew anything about direct sulphate of ammonia recovery to tell them exactly what their experience was. He believed that, in connection with new works, it was worth while considering the absolutely direct recovery of ammonia, and producing no effluent. This was a matter which he was going into. As to shock cooling, higher calorific values were obtainable by this means.

OPERATION OF THE ACID WASHER.

Mr. NORMAN WILTON said he was glad to be present at the meeting, and to have the opportunity of addressing the members. He thought they had hit the mark in saying that acid washing would go a long way towards getting them out of the difficulty in which they found themselves. When they were making an effluent that was not acceptable to the local authorities, it seemed to him the obvious thing was first to try to reduce the quantity; and having erected several acid washers, he could furnish them with proof that they did eliminate entirely water scrubbing on a gas-works, so that one had only to deal with the waste liquor which was produced when the virgin liquor was condensed from the coal. As Dr. Bailey had said, this condensate from the coal, if separated from the tar early, was not going to contain very much phenol or thiocyanate. He himself had seen in the liquor in some works actual oil floating on the surface, which he believed was practically all phenol. More could be done, he thought, in the direction of filtration or, in a very simple way, skimming the liquor. As to acid washers, they were quite simple to operate. The washer was first charged with water, and about 4 p.ct. of free acid. After the gas had bubbled through this, it became sulphate of ammonia liquor of 40° to 45° Twaddell. The free acid was maintained in the washer by adding a measured quantity of acid each day in proportion to the amount of coal carbonized. Thus in working the plant one simply added acid to the washer, and ran off sulphate of ammonia liquor 40° to 45° Twaddell. This sulphate of ammonia liquor was passed into the saturator of the sulphate of ammonia plant, and produced white salt, in the same way that ordinary liquor did. There was a good saving in steam; one had less liquor to boil-up; where the sulphate plant was possibly on the small side in a gas-works, the capacity of it was automatically increased; and the labour involved in working the plant was naturally reduced. He agreed with Mr. Ferguson Bell in saying that the industry did not want to spend a lot of money on plant, if they could avoid it, in getting over this difficulty; but it was some comfort to know that by acid washing they would be installing something that would be really an economy in itself. It had already been adopted by several large and small works, because it was a more economical method of making sulphate.

Mr. F. SHEWRING (Stratford-on-Avon) asked if Dr. Bailey could tell them what area of land would be required for running on it effluent with the object of allowing it to percolate the soil without any subsequent harmful effects. Some of them had evaded trouble with sewerage authorities by diverting their liquors in some cases on to waste ground and in others into tips. He had been able to divert his own to a waste tip; but it had occurred to him that there was a possibility of objection being raised at some time, owing to the effluents obtaining admission to underground streams. Mr. Wilton had really been advocating the semi-direct system of sulphate manufacture; and undoubtedly this would be a very excellent way of reducing the quantity of effluent. He had had some experience with a small experiment plant on semi-indirect lines, and was not altogether satisfied that it was feasible in many works. It required a lot of looking after, and what success one obtained with regard to reduction of effluents was very often set-off by trouble with the purification. By-passing could, of course, be resorted to; but if the plant was not looked after properly, there was bound to be great trouble.

Mr. TWINE, referring to the figure of 45° Twaddell quoted by Mr. Wilton, said this would give a gas engineer trouble. He felt perfectly certain of it, because at 45° Twaddell one had approximately 30 p.ct. ammonium sulphate in the liquor; and this would mean a liability to stopped pipes. If a figure was taken of 40° Twaddell, equal to about 35 p.ct. sulphate of ammonia, he was with Mr. Wilton.

Mr. WILTON: I agree to 40° Twaddell.

Mr. TWINE (continuing) said he started himself with 45° Twaddell, and insisted upon it being worked to; but he had to reduce it to 40°, and still there had been stopped pipes. By reducing the strength to 35° Twaddell, however, they had practically freed themselves from trouble.

Mr. POULSON: As to acid plant needing a lot of attention, I inquired particularly into this of a works which had been acid washing for ten years, and they told me very little attention was required.

OIL FILMS ON STORAGE TANKS.

The PRESIDENT: The author has told us that, by storage, liquor deteriorates in value very considerably—or, in other words, "oxygen absorption" increases. I should like to ask whether the plan has ever been tried of putting a film of oil on top of the storage tanks, to prevent contact with the air. From what has been said, it is oxygen principally which is the cause of the trouble.

Dr. BAILEY remarked that he was rather overwhelmed by the nice things that had been said about him. It had been a pleasure to come among them and get this important question ventilated in the manner it had been that afternoon. A layer of oil on the storage tanks for the prevention of oxidation had been used in a number of works, and, of course, it did obviate contact of liquor with air. A very thin film of oil would do it. One great trouble, however, was in the way the liquor was run into wells. One frequently found, on going to look at a well, that the liquor was running through a pipe that went into the well about 3 in., and the level of the liquor was about 3 ft. down. Why did they not put the pipe down into the liquor? If they were going to have an oil layer, it was necessary to avoid agitation, and so it must be in a quiet well. The longer the ammoniacal liquor remained in contact with the tar, the more impurities would be extracted.

FURTHER QUESTIONS ANSWERED.

A point had been made of the fact that works which had been for a long time running liquor effluents into sewers without objection were now being pulled up. There might be various explanations of this. They were "got at" by more authorities than one. The gas undertaking might satisfy one local authority, but that local authority might have to satisfy someone else, who might have reason for holding a different opinion—this somebody else being the river authority. Was the effluent passing away of the same composition as it was years ago? He thought quite possibly it was not. Another point was that a gas-works ten years ago would have been producing a certain amount of gas and liquor, and ever since that time the make of gas had been on the increase; so that to-day there was a great deal more liquor to deal with, and therefore additional contamination of the sewage. The reference by Mr. Langford to the temperature in his storage wells was important, and furnished an indication of the changes that might take place in these wells. What was the use of putting good, strong ammoniacal liquor at a low temperature into a well at a higher temperature? They were going to lose ammonia all the time. Mr. Twine had drawn attention to a statement in the paper to the effect that the amount of effluent would be one-and-a-half times the bulk of liquor. This was quite approximate, and the figure varied between works and works; but he thought the addition was generally round about the 50 p.ct. he had mentioned. He did not imagine there would be many people working at so good a figure as 30 p.ct. As to the effect of the acid washer on the devil liquor, he should not think the latter would go up enormously in oxygen absorption with vertical retorts. One thing that must be remembered in dealing with vertical retorts was that with a considerable amount of steaming there was a higher percentage of liquor in the condensers than under the older systems of carbonization. The point had been once more raised with regard to acid going forward to the purifiers. No doubt those present would have seen in the Technical Press the description by Mr. P. G. G. Moon, of Bournemouth, of the new gas-works at Pitwines, Poole, and the discussion upon it which had taken place at the recent meeting of the Southern Association of Gas Engineers and Managers, of which Mr. Moon was President. Now for years past the Bournemouth Company had been using an acid washer; and they had been so perfectly satisfied with the working of it that they had installed the same process at their new Pitwines Works. Mr. Moon said the only thing he found necessary was quite a small pipe for by-passing gas to his purifiers. In fact, he had worked for a long time even without that; but for safety's sake he had decided to by-pass gas, in order to keep the purifiers healthy.

CIRCULATE AS LITTLE LIQUOR AS POSSIBLE.

He had been asked by Mr. Rendle whether he objected only to circulating liquors through hydraulic mains, and whether they might be circulated *ad lib.* through the scrubbers, &c. Well, what he said was: "Circulate as little liquor as you possibly can." ["Hear, hear."]

The more they circulated liquor, the more contact they got with the oxygen in the gas—for, of course, there was going to be some in it. They should aim at reducing the contact as far as they could. His point with regard to hydraulic mains was that they should do everything they could to keep this liquor by itself. It would be high in fixed ammonia. In reply to Mr. Shewring, he could only repeat that people had used the acid washer, and found that it worked admirably. But, of course, these things would need attention. The area that would be required for the purpose indicated by Mr. Shewring—that was, for running on effluent with the object of its percolating the soil without harmful results—would depend upon a good many conditions, and largely upon absolute equality of strength of the liquor. One could not put a certain strength of liquor on one week, and another strength of liquor the next week. How much his ground would deal with under these conditions, he did not think anybody could say; the answer would depend entirely upon the character of the soil.

The PRESIDENT at this point seconded the vote of thanks to the author, and reminded the members that this effluent question did not really come within the purview of Dr. Bailey. It had been taken up by him more or less as a hobby.

Dr. BAILEY, acknowledging the vote (which was carried by acclamation), admitted that this was really "not his job," as he was not a gas engineer.

MIDLAND JUNIOR GAS ASSOCIATION.

On Thursday, Nov. 26, a visit was paid by about sixty to seventy members of the Association to the works of Messrs. John Wright & Co., Aston, Birmingham. After a tour of the various shops the party assembled for tea in the Social Club attached to the works.

Mr. J. H. GEE (President), proposing a vote of thanks to Messrs. John Wright & Co., said they had enjoyed a most instructive afternoon. Those who visited the works in 1919 would appreciate the progress made since then. The vastness of the foundry operations was certainly an impressive feature. The wonderful surface of the untreated castings was really remarkable; and Mr. Davies had told him that this was a thing at which Messrs. Wright particularly aimed. Another point which had impressed him was the care exercised to ensure accuracy in injectors, burners, diaphragms of radiators, &c. These details were important. To a great extent the gas industry depended on appliance makers to keep well ahead of competitors, and it was largely by firms such as Messrs. Wright that the industry had been enabled to maintain the foremost position. While on the subject of refinement of testing and finish of appliances, he ought to mention the new Research Laboratories recently opened in London by Radiation Limited, of whom Messrs. John Wright & Co. were members. These magnificent laboratories, which were in the charge of Dr. Hartley, who was with them, had been installed to tackle, not so much the everyday problems, but rather those which would come along in the future. On behalf of the Midland Juniors, he wished the new department every success. He did this with enthusiasm, because he felt certain that the success which should attend the venture would have its effect on the future prosperity of the industry as a whole.

Mr. C. F. TOOBY (Senior Vice-President) seconded the vote. He remarked that he, too, had been greatly impressed by the large number of processes through which the various fittings had to pass, and particularly with the care taken at every stage in seeing that an article was of sound construction. There was no doubt that great responsibility rested upon the manufacturers of gas appliances. If fittings were indifferent, then the reputation of gas went down; on the other hand, if fittings were of good quality the reputation of gas was enhanced. He considered that Messrs. John Wright & Co., by their research work and by the excellence of their products, had been a great help towards securing for the gas industry the successful position they held to-day.

Mr. J. F. DAVIES (Managing Director), in reply, said that he had been looking forward to the visit of the Midland Junior Association; it had been a pleasure to escort the members through the factory. The members of the gas industry and the gas apparatus manufacturers should co-operate. A few years ago a number of people thought the gas industry was a dying one; but he was sure there was more life in it to-day than there had ever been. Considering that this country had during the last few years passed through distressing times, with a large amount of unemployment, it was really remarkable that so many gas undertakings had been able to show enormous increases in the output of gas. Speaking of the gas apparatus side, he would like to point out that they had had no short time, and during this period of depression had enjoyed an actual boom. He thought their works had been one of the bright spots of Birmingham. He was sure there had been few factories in this area which could say that since the boom year of 1920 their people had worked full-time during the whole of the subsequent period. Not only had his firm worked full-time, but they had also considerably increased the size of the factory and the number of workpeople—which spoke volumes for the healthy condition of the industry, for they depended upon the gas undertakings. Not only was the firm doing well in Great Britain, but, though the British export trade had suffered severely during the past few years, their own export trade was far in excess of what it was before 1914. This went to show that their appliances were much improved, and the efficiency was such that, despite the increased price of gas, the service to the consumer cost no more than it did in 1914. In the Colonies, where gas was dearer than it was here, they were able to meet foreign competition; and this applied also to Australia and New Zealand. They were, in addition, making big strides in South America and other countries. He would like to give them a few particulars of their Essex Works. The gas consumed for the twelve months to the end of September this year was 19,281,000 c.ft. This consumption, he believed, was in excess of the annual make of several of the small gas undertakings in this country; and it would give some idea of the usefulness of gas so far as they were concerned. During the past few months they had converted the stove-enamel ovens from coke-firing to gas-firing. This had been a very profitable change. The gas-heated stove enamel ovens, embodying their patent flue-outlet-at-bottom construction, based on the Radiation "New World" cooker patents, had a total output, per square foot of oven bottom, double that of the solid-fuel ovens they replaced. They had been able to eliminate overtime; they had doubled their output; and, in spite of the price of gas to-day, their expenses for gas during the past twelve months for the total output showed an actual decrease as compared with the cost of coke and labour. He felt that gas for industrial purposes would make more and more progress when it was realized, as they had realized, that, consumed in efficient apparatus, it was less costly than solid fuel, taking into account the storage space, labour of handling, output, accuracy of temperature control, and other important considerations. The firm had a Social Club which was placed entirely at the disposal of their workpeople, who had their social evenings, and their meals there. In connection with the Club, they had a sports ground. He was sure this had done a great deal to bring about an excellent feeling between the workpeople and the management. They had been fortunate, he considered, in running for many years without any serious disturbance. He was satisfied that, by giving greater consideration to the welfare of their people, British manufacturers generally would make much more progress than had been the case during the past few years. The output to-day at the Essex Works was considerably more than in 1914.

Dr. HARTLEY, Head of the Research Department of Messrs. Radiation Limited, said that Mr. Gee had spoken of the Radiation Central Research Laboratories which had been opened recently. Details regarding the equipment were given in the "GAS JOURNAL;" and there was no need for him to add to that report, which most of them would have seen. The object in view in creating these new laboratories was to enable research work on more fundamental problems, concerning which they required information, to be removed from the works laboratories. The laboratories at the different factories continued their routine work. Much of their time was concerned with investigations the bearing of which on the production of their gas apparatus was not always immediately obvious. Such work often necessitated time, a considerable amount of patience, and a long purse, as there might not result an immediate return on the money expended. Experience had shown, however, that if success attended their work, the ultimate reward, for both themselves and the industry, would be much greater than would result from continued application to detail improvements in particular pieces of apparatus. Of the many investigations they had in hand at the present moment, the Association would probably be most interested in what they were doing to ensure that combustion should be complete in their gas appliances. Examination of the products of combustion resolved itself into the detection of small quantities of carbon monoxide. This work had been in hand now for some years, and in connection with it a senior member of their chemical staff had, for many months, been engaged solely on the examination of the chemical phenomena involved in the actual oxidation of carbon monoxide by iodine pentoxide—the chemical change on which their work was based. They had developed the method to an extent enabling them to attain for routine purposes an accuracy of one or two parts per 100,000. In view of the fact that air containing ten parts of CO per 100,000 could be breathed without harmful results, they had thus been able to ensure that the routine examination of their appliances was carried out under conditions which might be described as having a factor of safety of 10. For the examination of the bunsen flame itself it was necessary to attain an accuracy of one or two parts per million; and it was in this connection that the investigation of the chemical reaction to which he had made reference was necessary. They employed the routine apparatus for the examination of all new appliances, and for this purpose new apparatus which might have been developed in the works was passed through to the Central Laboratory for approval. They intended that the hall-mark of Radiation Limited should not be a mere figure of speech. As no doubt all of them were aware, special attention had been paid to this question in connection with the design of the "Rado" burner, characterized by its Tudor-rose type of flame. The problem was not merely to ensure that the burner would give complete combustion after adjustment by the fitter, but so to design it that such a state of affairs would continue in actual practice. The drilled ring burner had two outstanding defects. The spilling of food was liable to choke up the flame orifices, and increase in pressure resulted in a lengthening of the inner cone. Each of these defects might result in incomplete combustion. They would find it an interesting experiment to watch the effect of change in pressure on the cone length of a "Rado" as compared with others. Mr. Davies had spoken of the improvements in design which had taken place in recent years, and had made reference to the important step forward which they had in the "New World" cookers, which were characterized by having the flue outlet at the bottom. Those of them who were in close contact with the development of gas appliances did not always realize how great were some of the changes which had taken place over a period of years. It was because they believed that it was only by carrying out pure research that they would be able to continue developing satisfactorily, that their new Research Laboratories had been equipped.

YORKSHIRE JUNIOR GAS ASSOCIATION.

[In his Presidential Address, Mr. R. N. Webb describes the developments which have taken place in the thirty years during which he has been at the New Wortley Works of the Leeds Gas Department. His long practical experience of carbonizing with horizontal and inclined retorts makes his remarks particularly valuable. He thinks that the system of bringing the secondary air and producer gases together at the base of the combustion chamber, and thoroughly intermixing them at this point, is entirely wrong. Among several other points which he stresses, he mentions simplicity as being a most desirable feature in the design of settings.]

A Meeting of the members of the Association, to hear the address of their new President, Mr. R. N. Webb, of Leeds, took place in that city on Nov. 21. The meeting proper was held in the Civil Court at the Town Hall; but it was preceded by a gathering at the New Wortley Gas-Works, where Mr. Webb has been engaged for the past thirty years, during twenty-one of which he has been the Manager. By permission of the Gas Committee and the Engineer and General Manager (Mr. C. S. Shapley) the party were enabled to make a tour of inspection of the works, and were afterwards entertained at tea as guests of the Leeds Gas Committee. There was a very good gathering, particularly so in view of the heavy fog prevailing and serious delays in train services.

When the members were assembled at the New Wortley Works, Mr. Webb briefly introduced—though he remarked how unnecessary was any such introduction to Yorkshire gas men—Mr. C. S. Shapley.

Mr. Shapley, welcoming the members, said it was a pleasure to be able to address the Association of which Mr. Webb was the President. Mr. Webb was a keen worker and an enthusiast, and he (Mr. Shapley) felt that he would do honour to the office. Mr. Webb had been at the New Wortley Works for a considerable number of years, and during that time he had added very materially to the constructional work there, features of which the members would observe on the tour. He considered that the Yorkshire Junior Gas Association was fortunate in having so many members who were willing to give up their Saturday afternoons to attend such meetings every month. In addition to the broadening of knowledge, it would no doubt result in adequate remuneration being obtained by the members in their various spheres of activity. The Association was of vital importance to the gas industry. Referring to the value of team work in an undertaking's policy, Mr. Shapley said that at Leeds they worked as one man. He maintained that if they did not do that, the best would not be brought out of each man, and they would not be helping each other to the best advantage. When, later, he assumed the presidency of the Manchester District Institution of Gas Engineers and Managers, he would be glad to welcome Mr. Webb to their meetings and he would support the Junior Association as far as possible. He urged all association secretaries to make sure that the Press were advised of meetings. The industry must co-operate with the Press, and obtain as much publicity as possible. Many times topics of vital importance were introduced, and discussions on them would be helpful to the industry in general. Many statements had been made regarding cheap electricity, and he had investigated a good many of the claims both in his own city and in other large centres, basing charges on rateable value. He said emphatically, after a thorough investigation, that there was no such thing as electricity at ½d. per unit in the cases he had observed—even in districts where electricity was supplied from works that were considered to be of the best. He had examined electrical heating, water boiling, and cooking, among other phases of electric uses, and after what he had seen he did not think that for such purposes the gas industry was up against anything of which it need feel afraid. He suggested that they, as members of the Junior Association, should do all in their power to further the uses of their product, and bear in mind what he had previously said—that there was no such thing as ½d. per unit electricity.

Mr. Webb briefly expressed to Mr. Shapley the thanks of the gathering for his welcome.

At the subsequent meeting, in the Leeds Town Hall, Mr. S. T. S. Musgrove (Sheffield), Senior Vice-President of the Association, occupied the chair during the earlier part of the proceedings, but having to leave early for an engagement in connection with the Sheffield Gas Company, his place was taken subsequently by Mr. C. H. Chester (Wakefield), Junior Vice-President.

Mr. Musgrove said he had no need to introduce Mr. Webb, who was to give them his presidential address. From what they had seen that afternoon of the works about which Mr. Webb was to speak, he was sure they would benefit greatly.

Mr. R. N. Webb then delivered his

PRESIDENTIAL ADDRESS.

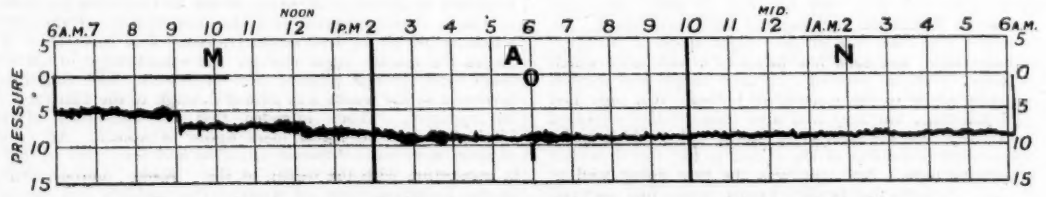
[Extracted.]

After describing the developments which had taken place in the thirty years during which he has been at the New Wortley Works of the Leeds Gas Department, Mr. Webb passed on to the subject of seals in the hydraulic mains. He said:

Anyone who has attempted to reduce the seals on several benches of retorts in different retort houses will appreciate the difficulties, and the length of time it takes to accomplish the task. In our own case we were for six to seven years gradually reducing seals until we got down to ¼ in. We noticed that, every time we were able to work with reduced seals, the results, both in quantity and quality, improved, and that we got the best results with a seal of ¼ in. We worked at this seal for some time, but finally determined to have no seal. What decided us to take this step was the fact that we could not maintain the hydraulic mains level enough to ensure each retort being under the same exhauster conditions.

In 1913-14 we introduced Cort's anti-dips throughout our incline house; and they at once gave us entire satisfaction. For several years we worked the horizontal retorts by sealing the dip-pipes while discharging and charging, and unsealing them when gas making. This method was not altogether satisfactory, though a distinct improvement; and in 1921 Mr. Shapley decided to instal Cort's anti-dips on the eight beds we rebuilt in that season. The results were again so satisfactory that there was no hesitation in installing them on the other beds as we rebuilt them; and all the retorts we are working to-day are fitted with these anti-dips. I consider the use throughout of these appliances enables us to work under conditions as nearly ideal as possible. We are all aware that, whether we employ seals or not, it is impossible to treat each retort in a bench individually; and, as the maximum quantity of gas is being produced from one retort the minimum amount is coming from another, and we are compelled to arrange our pull to suit both conditions as nearly as possible. I suggest that, when working without seals, all dip-pipes are equally subject to exhauster conditions, which I do not think can be said when seals are used. The conditions that appear to me to be most suitable when working without seals are those of no pressure—no vacuum at the level of the retorts—and this is the method we have adopted.

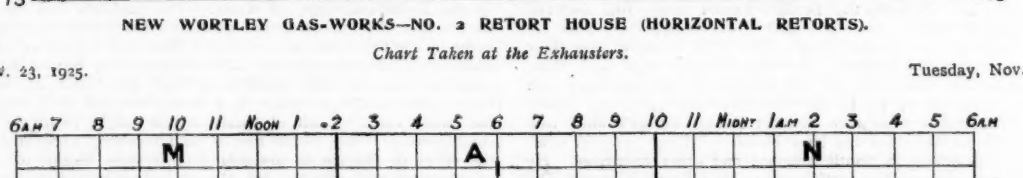
To ensure as great a degree of accuracy as possible, we use



NEW WORTLEY GAS-WORKS—NO. 2 RETORT HOUSE (HORIZONTAL RETORTS).

Chart Taken at the Exhausters.

Monday, Nov. 23, 1925. Tuesday, Nov. 24, 1925.



NEW WORTLEY GAS-WORKS—NO. 2 RETORT HOUSE (HORIZONTAL RETORTS).

Chart Taken in the Retort House.

Monday, Nov. 23, 1925. Tuesday, Nov. 24, 1925.

From these charts it is interesting to note that, while 4-tenths of vacuum have been put on at the exhausters, the zero line is maintained in the retort house. The reason for the increased vacuum in the exhauster house is that a further 1 million c.ft. a day unit was started up.

recorders of the water-float type (supplied by Messrs. Thomas Thorpe & Co.) having an extended scale in the ratio of 4 to 1, so that $\frac{1}{10}$ in. actual water-gauge is enlarged to nearly $\frac{3}{8}$ in. on the chart. The recorders, which show up to 1 in. vacuum or pressure, work very well indeed, and are most reliable.

We do not use retort-house governors at all; the steady vacuums being maintained solely by the exhausters. I am not condemning retort-house governors. If I was working two or three retort houses from one common main, I would be the first to instal governors; but the less obstruction you have from your exhauster to your retorts, the more likely you are to make your gas in a perfect condition. When you are only working one retort house, and employing foul mains with a capacity such as ours, there is no need for retort-house governors.

It is impossible to obtain good results from badly-designed settings or with inadequate knowledge of how to work them. The question at once arises: What is a well-designed retort setting? I have no doubt that there are many different ideas as to what does constitute such a setting. I wish it to be understood that I am referring only to horizontal and inclined types. It can at once be said that, from the laying of the first firebrick in the construction of a retort bed, everything is of the utmost importance. Any carelessness or inferior workmanship should not be allowed to pass, as sooner or later such work will betray itself—often with serious results.

There are several important features which require careful study when designing a retort setting, and I here set out a few of them:

1. The cubic capacity of the producers, and the superficial area of the grate.
2. The type of producer.
3. The size of the nostrils for the producer gas and secondary air.
4. The admission of the producer gas and secondary air into the combustion chamber.
5. The manner in which combustion is induced to take place.
6. The thickness of the supporting walls and the spaces between them.
7. The essentials of a regenerator.
8. Simplicity of design.

Regarding feature No. 1, the coke capacity of a producer should be not less than 8 to 9 c.ft. per ton of coal carbonized per bed, depending on the quality and size of the coke fed into the producer. With coke from 12-hour charges, the depth for the primary air to pass through should be 6 ft., and the grate area not less than 1·5 sq. ft. per ton of coal carbonized per bed. These figures are for producers with step-grates.

No. 2.—I have often been surprised that the ordinary "open" type of producer is so consistently built in new installations of horizontal retorts. By "open" producer, I mean the type in which directly you take off the charging lid, the air can be drawn straight into the combustion chamber to the nostrils. This type of producer is unfortunately all too commonly erected. In my opinion the curtain-wall type of producer is a much better and more scientific one, and has several practical advantages over the more common producer. It is necessary to maintain the same depth of coke and grate area for the primary air to pass through in one as the other; and with the curtain-wall type it is essential to have as deep a bed of fuel above the arch as below it. This means a much deeper producer over-all than the "open" type; but I feel sure that the superiority of it is more than worth the extra first cost that may be entailed.

No. 3.—The sizes of the nostrils for the producer gas and secondary air are an important feature of a setting. Our practice is to have them as small as possible consistent with not retarding the easy flow of the gases.

No. 4.—The admission of both the producer gases and the secondary air into the combustion chamber should be such that both enter as nearly vertically as possible.

No. 5.—The manner in which combustion is induced to take place is, in my opinion, about the most important feature of all. It seems to be the usual practice to bring the secondary air and producer gases together at the base of the combustion chamber, and thoroughly intermix them at that point. I think this is entirely wrong. Such a thorough mixing results in an intense local temperature, with consequent damage to the surrounding brickwork, &c., and only moderate heats in the retorts further away. It is necessary to remember that all the coal in the retorts is not on the combustion chamber side, and equal heat is required on both sides to effect proper carbonization. That this is effected in any setting is open to doubt; but I think it is very necessary to do all we possibly can to bring it about.

We have attempted to do it by bringing in the secondary air at an angle of 60° just below the bed of the bottom retort and 12 in. to 14 in. above the producer gas nostrils. We are convinced, from experience, that combustion is now taking place quietly and gradually for a considerable distance round the retorts.

No. 6.—The thickness of the supporting walls and the spaces between them are both important matters, upon which we are probably not all agreed. Up to 1922 we had always built the settings with 9-in. walls and 9-in. spaces, but we then determined to reduce both the thickness of the walls (except at retort joints) and the width of the spaces, for several reasons. By having more walls and reduced spaces, the retorts are supported more frequently, which adds to the mechanical strength of the setting. The increase in the number of spaces gives us an increased number of nostrils, which enables us to distribute more evenly the heat over the full length of the retorts. The walls are now 6 in. thick, and the width of the spaces $7\frac{1}{2}$ in. There are 32 producer-gas and 32 secondary-air nostrils in each setting.

No. 7.—The essentials of a regenerator, I think, are well known. The most important one from a theoretical standpoint is its ability to transmit the heat from the waste gases to the secondary air as completely as possible. Its most important one from the practical point of view is its soundness, or freedom from short-circuiting. The latter is, I think, more important than the former. To effect both, there have been many special regenerators designed, more or less successfully.

Our regenerators are designed in as simple a manner as possible, not only to achieve these objects, but also to offer as little resistance as possible to the flow of gases. The division wall is built of special bricks, $4\frac{1}{2}$ in. wide, rebated into each other, and the wall is also rebated into the middle and front walls of the setting. The flues are each $4\frac{3}{4}$ in. wide, and are open from top to bottom, with the exception of the area taken up by the staggered half-bricks, which act as heat conductors and as stays to the division wall. There being no dividing joint in the division wall, the transmission of heat is fairly rapid.

No. 8.—Our experience is that the simpler the design of the settings the more likelihood of success; and anything in the nature of restricted areas or tortuous passages for the gases is to be avoided. Our settings are so designed that, from the secondary air inlet to the waste gas outlet, the gases rise and fall in a vertical direction only; there not being a single travel in the horizontal direction either lengthwise or crosswise. This allows us to work with a minimum draught, thus ensuring complete combustion and as full use of the heat obtained as possible.

I should like to describe briefly the construction of our inclined retort setting. The principal feature is the division of the setting into three distinct sections—bottom, middle, and top—controlled by six dampers, two to each section. The producer-gas chamber is, of course, common to the whole; but immediately the producer gases pass through the nostrils, they are controlled by their individual dampers. The secondary airs are each distinct and separate, as are the waste gases—*i.e.*, there are six secondary air and six waste gas chambers. The reason for this division into three sections is that the slightly heavier charge for the first four to five feet at the bottom end of the retorts, which is natural, can be dealt with without damaging that portion of the retorts where the lighter portion of the charge rests, as with the case when the setting was only divided into two portions. This method of controlling the settings has always given us the utmost satisfaction, and it is an easy matter to have any section at any desired temperature. Another feature of our inclined setting is that the combustion chambers are set horizontally, enabling cleaning out and repairs to be carried out easily. The zone of combustion of the producer gas and secondary air is kept at the same angle as the retorts. This is achieved by placing extension nostrils over the ordinary producer-gas nostrils, and conducting the producer gases to the zone, meeting the secondary air which has also been conducted from the secondary air chambers by means of tubes placed at different angles. The walls and spaces have been made as numerous as possible compatible with safety, and the same simplicity of travel for the gases has been observed as before described. Another feature is that all the brickwork is set horizontally.

The proper working of a regenerator bed can only be accomplished by the combination of a thorough knowledge of its construction with science and common-sense. It is not possible to work similarly designed beds of retorts in exactly similar ways on different works. Each manager should decide what is the best method for his own works; and he can only do this by investigating the whole matter.

Analyses of the producer and waste gases are most essential, the exact draughts above and below the dampers are very important, the clinkering and filling-up periods should be carefully regulated, and the temperatures of the combustion chambers should be frequently taken.

We have for some time been carrying out most instructive and interesting work on the above lines on our horizontal retort beds. The draughts are carefully taken and set by means of a delicate King's gauge reading in one-hundredths of an inch, the amount of carbon dioxide in the producer and waste gases is recorded by a Webster and Ringrose CO_2 recorder, checked frequently by chemical analyses, and the combustion chamber temperatures are taken at least twice a week with a "Cambridge" optical pyrometer. The draughts we work at are seventy 100ths below and thirteen 100ths above the dampers, the combustion chamber temperatures average 1385° C., and the waste gases 570° to 580° C.

The amount of CO_2 and CO in the producer gases varies considerably with the manner in which the producer is worked. We are told from time to time that particular designs of producer grates will put an end to the formation of clinker. I must confess that I have not yet been able to see what the actual design of grate has to do with the formation of clinker. What

I can see is that the step-grate, or any grate, that allows of easy access to its whole area can be cleaned more easily than the older type of horizontal bar grate; and, by this fact of more frequent cleaning and poking, the serious formation of clinker is avoided. But clinker would be formed equally as seriously as in the older type of grate if it were not for this extra cleaning—I should add here, granted grates of equal area. The formation is a heat reaction, and is not interrupted by a piece of iron. I wish to point out, however, that the oftener a fire is interfered with, the more fuel is wasted and the worse in quality is the producer gas formed.

We employ step-grates which will suit the worst class of coke we use in the producers. There are five steps with fairly wide spaces between them, which permit of the easy removal of the clinker. We clean them every eight hours if necessary, and, when possible, we do not touch them from cleaning to cleaning.

We have taken charts showing the differing percentages of CO_2 in the producer gases when cleaning out at eight and twelve hour intervals, with the corresponding temperatures in the combustion chambers. They are as follows:

8-hour cleaning . .	p.ct. CO_2, 8 to 9 ..	Temp. ° C., 1385
12-hour cleaning . .	p.ct. CO_2, 5 to 6 ..	Temp. ° C., 1360

These are interesting, as showing that, while better producer gas is obtained with 12-hour cleanings, slightly higher heats result from the 8-hour cleanings. We have by no means finished our investigations on this subject, and I am sure that any time devoted to the perfecting of the handling and working of producers will be well repaid, for, being the starting point of carbonization, their successful working is essential.

I extend my sincere thanks to Mr. Shapley for his friendly criticisms and help in the preparation of this address. I also wish to thank my Assistant, Mr. Appleyard, and the Chemists, Mr. Lewis and Mr. Dearnley, for their unstinted and wholehearted work on my behalf.

Mr. J. B. BALMFORTH (Bingley) moved a hearty vote of thanks to Mr. Webb for his address, and for the admirable arrangements he had made for the members to see the New Wortley Gas-Works. After hearing the address, and noting the remarkable work Mr. Webb had put into his job during so many years, they must all fully agree with Mr. Webb when he said he regarded carbonization of coal as a hobby in addition to his profession. It had been his life's work; and the plant as it existed to-day was testimony to the success of his endeavours.

Mr. C. T. B. ROPER (Bradford) seconded the proposition, and Mr. WEBB briefly responded.

Mr. J. W. HORWILL, Hon. Secretary, proposed a vote of thanks to the Property Committee of the Leeds City Council, for the use of the Civil Court; and to the Gas Committee and the Engineer and General Manager (Mr. C. S. Shapley), for the facilities afforded for the inspection of the works, and the hospitality accorded the visitors.

Mr. E. GILLETT (ex-President, Bradford) seconded, and the proposition was carried with acclamation.

Discussion.

The CHAIRMAN (Mr. Chester) said that the perfecting of the retort house was highly important. At the undertaking with which he was concerned, they had recently reconstructed their retort house; and when they were studying about the design, many of the factors which Mr. Webb mentioned had cropped-up. He admitted, however, that one or two points evaded their notice. It must have taken many years of close study to bring retort sets so near perfection as those at New Wortley.

Mr. F. FIRTH (Leeds) remarked that Mr. Webb advocated small nostrils for the producer gas and secondary air. This suggestion, however, meant that there must be more brickwork and spaces, but Mr. Webb later advocated reducing the thickness of the wall and decreasing the spacing in the brickwork. Did not Mr. Webb think that this offered more chance for the gases to impinge on the brickwork? It was the contact of the producer gas with the silica work that helped combustion. Mr. Firth said it was desirable to keep the gas and air as much as possible out of contact with the brickwork. In regard to temperatures—the 1385° C. for 8-hour cleaning, and 1360° C. for 12-hour cleaning—in all probability with the 8-hour cleaning one would get more gas through, because there was a cleaner fire; and though the quality of the gas might be lower, there might be compensation in the larger quantity. He thought the 8-hour cleaning involved waste of fuel. In an experiment which he undertook, they never clinkered for 14 days; though he admitted that they were rather favoured by conditions at the time. The CO_2 in the gas produced had never increased beyond 4 p.ct. To his mind, the best thing was to clinker as little as possible.

Mr. J. B. BALMFORTH (Bingley) remarked that Mr. Webb had given no manufacturing or maintenance costs; but these were vital in any comparison of one system of carbonization with other methods. Also, there were no figures for fuel consumption. In regard to the design of plant, Mr. Webb advocated the projecting producer, but he (Mr. Balmforth) suggested that by this type there must be some loss of heat—heat which was saved with an internal producer. Were there curtain type producers which avoided loss of heat through radiation? If Mr. Webb had a costing system in regard to his plant, it would be very interesting to know it. In regard to the stiffening of walls, the suggestion of walls of 6 in. thickness meant the employment of a special brick, because, as they probably all knew, the standard size was 9 in. by 4½ in.

Mr. E. GILLETT (Bradford) said that at his own plant they had a small grate area. They had only 16 ft. for 20 tons per day. To get temperatures, what he needed was volume. As Mr. Firth had said, they could get the same temperatures by furnishing a larger quantity of low quality gas as by a smaller quantity of high quality gas. On the matter of small nostrils, he was in entire agreement with Mr. Webb. Mr. Gillett remarked that at Bradford they clinkered every 24 hours. By this, he meant a thorough cleaning; and he assumed this was what Mr. Webb had meant in his paper. (Mr. Webb: Yes.) If it was only a shaking-up that was concerned, this was done every 2 hours, thereby getting a steady flow resulting in about ½ to 1 p.ct. of CO in the waste gases. As a matter of fact, the quality of the coal used really determined what one had to do with the producer. If one had a poor coal, one had a poor fire, which therefore had to be pricked often. With regard to retort-house governors, they had had a very unfortunate experience with them at Bradford. Mr Gillett said he had never seen inclined sets to equal those of Mr. Webb's plant. Mr. Webb's paper showed what could be done by attending to detail.

Mr. J. W. WOOD (Leeds University, Fuel Department) said the address had been essentially one for gas manufacturers. In going round the works he had observed the points at which Mr. Webb had installed his pressure gauges and recorders. Undoubtedly the positions he had chosen for the off-takes of his gauges were excellent.

Mr. CHESTER, closing the discussion, said he could hardly agree with Mr. Webb on the question of the open type of producer. Mr. Webb preferred the curtain wall. From a strictly scientific point of view probably he was right; but had he weighed-up the cost of working it compared with the results obtained? He (Mr. Chester) agreed that they should not get primary air going in at the charging door. In Mr. Webb's plant the coke had to be quenched and then shovelled into the producers; and this, he thought, would outweigh the advantages of the type advocated by Mr. Webb.

Mr. WEBB, replying to the discussion, said he much appreciated the views of the speakers and the points they had raised. Mr. Firth questioned his policy as to the size of nostrils. It had been the custom for settings to be designed with 9 in. walls and 9 in., or wider, spaces. Mr. Webb said he had nothing to say against this, provided the retort material was strong enough to withstand the severe pressure put on to it by discharging machinery when at a temperature approaching 1400° C., and when the charge of coal jammed. He was, of course, speaking only of fireclay retorts. The reason for their not employing silica retorts at New Wortley was their doubt as to the silica withstanding the action of water from the discharging machine ram glands, which might tend to spall silica retorts very seriously. He did not declare definitely that it would do so. He could only be sure of that by experience. Therefore they had adopted what, from sheer practical experience, was to them the best way in the matter—more walls, of a thinner section, whereby the heat travelled through to the retort quicker; spaces reduced, so that they got a retort which was certainly mechanically stronger; and reduced sizes of nostrils. These in some retort settings were possibly 9 in. long by 4 in. or 5 in. wide, and there would be 24 of them in a setting. If the nostrils were diminished, the retorts could be heated more successfully. That had been proved in the new settings built at New Wortley since 1921. Mr. Webb said he was convinced that the thinner the walls, the better. He did not think the question of back-pressure came in practically. Even with 7½-in. spaces there was so much free space that the friction did not have any effect. The result was that they were working their latest type retorts with less draught above the damper than they were before. He agreed with Mr. Firth that the cleaning of the producer tended to waste fuel. He fancied, however, that in Mr. Firth's experiment, when he did not clinker for 14 days, it possibly took nearly 14 days to remove it when they did it. With 12-hour cleaning they were accustomed to a certain temperature. They took the temperature, and went on to 8-hour cleaning; and the result was an immediate benefit in temperature in the combustion chamber. This, however, was admittedly largely a point which each engineer had to settle for himself, according to the quality of the coal received. However nicely set the producers might be on coals that were worth calling coals, there was a difference within 24 hours on some slacks; and this was very disheartening. It was the constant change of fuel qualities that prevented the most strictly efficient working of producers. Mr. Balmforth had mentioned outside producers. A question arose there of projecting producers *versus* producers built in the settings. Were they sure the whole of the heat from the producer was used in the setting? In designing retort settings, they had to take nothing for granted. So far as the speaker's works were concerned, the outside producers paid for themselves; and any little heat they might lose to the atmosphere was covered over and over again, particularly on inclines, by the saving in time and labour. In reply to Mr. Chester with regard to the open type of producer as compared with the curtain wall producer, to his (Mr. Webb's) mind the latter had all the advantages. In shovelling coke into the open type of producer there was always fine coke dust, and much of it was likely to be deposited on the silica nostrils, tending to fuse them. With a curtain wall producer, where the depth of coke was equal above and below the area, one could take-off the lid, and no dust or air would get through into the combustion chamber, and only the best producer gas would get through. The curtain wall producer could be filled quickly.

Bulletin of the "S.B.G.I."—The half-yearly Bulletin of the Society of British Gas Industries (a copy of which has been received from the Secretary, Mr. Arthur L. Griffith) contains the full report, reprinted from the "JOURNAL," of the proceedings at the autumn general meeting, which was held on Nov. 12, under the Presidency of the Right Hon. Sir Alfred Mond, Bart., M.P. There is also in it much other information of value to the members.

SHIPPING ENGINEERING AND MACHINERY EXHIBITION.

Some of the Exhibits Described.

In the shipping industry the cloud of depression is lifting, and hope is renewing itself. According to those who have to balance their accounts on the state of trade, the bad spell is going; and the pessimists are finding it more difficult to produce the evidence that justifies despondency and glorifies gloom into a national duty. Conditions were certainly worse in 1923, the year of the last exhibition. In the account in the "JOURNAL," however, the fact was pointed out that inventive genius was not dependent on trade economics, and that the many improvements which had been effected in every field of engineering constituted sufficient proof that any stagnation was not due to internal causes. At the Shipping Engineering and Machinery Exhibition held at Olympia from Nov. 23 to Dec. 5, there was plenty of evidence that this inventive skill is by no means a diminishing quantity, and that efforts made during the slump period are, with improving conditions in the industry, meeting their due reward. Visitors to this educational and practical exhibition were able to see the reflection of new inventions and processes, and improvements to existing methods, in terms of actual products. Official visits were paid on Dec. 2 by the Institution of Gas Engineers and by the London and Southern District Junior Gas Association.

MEASURING INSTRUMENTS.

The fact that in most processes economy in working depends on accuracy of control is becoming more and more appreciated; and there were several firms exhibiting their measuring apparatus.

KENT METERS.

A most attractive stand was that of George Kent, Ltd., of London and Luton, on which they exhibited their gas and water meters. It is about twelve years since this firm developed their Venturi water meter for the measurement of large air flows; and it was felt at that time that this type of meter could be advantageously used for the measurement of gas. Commercial gases, it was found, were liable to cause deposit in the Venturi tube. This difficulty was overcome by providing a heater on the throat section of the tube, for use during the colder months, and by making the inside of the tube easily accessible for inspection and cleaning. Also, commercial gases, owing to the variations in the "make," have no definite weight per cubic foot at any given temperature and pressure. This fact, which gives rise to no trouble in the case of the "Shunt" meter (which measures the velocity of the gas irrespective of its density), caused considerable difficulty in the Venturi gas meter, the registration of which is dependent on the square root of the density of the fluid passing. To overcome this difficulty, the firm developed two types of recorder: The "Station" recorder, which automatically takes into account every variation in the specific gravity of the gas, and registers volume exactly as do the drum type and the rotary type meters; and the "District" recorder, which has a smaller range of accuracy than the "Station" type, and which, instead of automatically taking account of the variations in the specific gravity of the gas, is used with a table of corrective factors for the gas measured. The firm have also developed a modified form of the "District" meter for measuring high-pressure gas. All these types of meter were exhibited on this stand; and in addition the firm showed a modification of the "District" meter for measuring the flow of gases at low static pressures—such as the gases in boiler flues, &c. Messrs. Kent make a strong point that the Venturi tube is more satisfactory than most devices for measuring dirty gas. The internal contour of the tube is smooth, so that the necessary differential pressure is obtained without the formation of eddies, which always encourage deposits. Also, the high velocity of the throat, aided by gravity when the tube is installed vertically, tends to sweep away any deposit that may occur. For measuring very dirty gas, however, an orifice known as the "Self-Cleansing" has been brought out. This is very useful when the gas contains considerable quantities of tar.

"ARKON" INSTRUMENTS.

Walker, Crosweller, & Co., of London, had many interesting exhibits. Their "Arkon" gas volume recorder attracted considerable attention. This apparatus is neither large nor costly, and is eminently suitable for works conditions. The principle is the measurement of the pressure difference set up by the intervention of a throttle disc or nozzle in the gas stream, or of a Pitot tube, Brabbée tube, or similar device which works only at points in the stream. The throttle device is usually to be preferred. It causes a slight loss of pressure, however, and where this is not permissible, it is necessary to use the single point measurement. The construction of the "Arkon" gas volume recorder is extremely simple. A cylindrical container is filled with water up to an overflow, and carries a specially-designed float. The pipe from the high-pressure side of the throttle or tube device is connected to the underside of the float, and the pipe from the low-pressure side of the throttle is connected to the air space above the float. The two pressures therefore cause the float to take up a definite position, which is communicated by a pen rod to a chart. As the differential pressure measured by the recorder varies as the square of the velocity, it follows that the simple float will give unequal chart divisions. For some measurements this does not matter, and may even be an advantage. With this unequal chart, however, the diagram cannot be measured without a planimeter. To equalize the chart divisions, the float is made of a special shape, so as to change the velocity-squared value into a straight-line value. By making this alteration, the reliability of this type of recorder is the same as that of the simple float type.

The firm had many other appliances of interest to show. These included portable, reversion, and multiple recorders, vacuum recorders with open-scale charts, and differential draught recorders. All these instruments are based on the hydrostatic principle. Water is the usual filling medium, and practically the whole of each gauge is made of brass. The pen gear is directly connected to the float; no link motion or other gear being interposed. The range of the instruments can be varied, and the dimensions and the revolution period of the chart drums are also variable. The "Arkon" multiple draught and pressure recorders, it may be mentioned, have either two or three pens writing on the same sheet. The diagrams can be on the one chart and written in different coloured inks, or can be written one above the other on their separate charts, but on the same sheet of paper. This method of multiple recording applies also to the "Arkon" CO_2 recorder. Further items of interest on the stand of Walker, Crosweller, & Co., included a 10-c.ft. laboratory gasholder of light but strong and durable construction, and a set of pressure gauges the convenience and practical design of which would delight the eye of any workman who has been used to gauges of the "finicky" type.

"ELECTROFLO" RECORDERS.

The Electroflo Meters Company, Ltd., of London, demonstrated several examples of their measuring instruments. Their "Electroflo" gas meters are dependent on two physical laws—viz., the relation between velocity of fluids and differential, and Ohm's law. All mechanisms and moving parts have been eliminated, and electrical instruments are provided for indicating, recording, and integrating the rate, characteristics, and quality of the gas flow. Each instrument functions independently, and with precision and accuracy. An important point about these appliances is that they can be located where desired, irrespective of the distance remote from the measuring point, and can be centralized, separated, or duplicated to meet individual requirements. The thin monel-metal orifice plate employed as the differential medium is inserted between existing pipe flanges, and involves no alteration to the main. The diameter of the opening depends, of course, on the maximum capacity required, and is calculated to produce a drop in pressure to meet prevailing conditions. Any form of differential medium can, however, be employed with the "Electroflo" meter.

The firm also specialize in temperature and pressure recorders, and they had on view at the exhibition the "Electroflo" combined pressure and temperature recorder. There are many applications where it is desirable to record on one chart both temperature and pressure, for by having both records on one chart the time interval is the same. One pen of the combined recorder is connected by bulb and tubing to the point where the temperature is to be measured, and the other is connected by piping, and records the vacuum or pressure. The "Electroflo Duplex" recording pyrometer has the advantage that the two charts are entirely separate, and it is possible to use at the same time any two ranges desired. Carbon dioxide indicators and recorders were shown; and it is of interest to note that the Electroflo Meters Company also specialize in long-distance gas-pressure signalling instruments.

"SIGMA" APPARATUS.

The Sigma Instrument Company had an attractive display of their various indicators and recorders. The "Sigma" B.Th.U. recorder for dirty gases was exhibited. This is for giving a continuous record of calorific value of unpurified gases. The operation is simple. Gas is sucked through an orifice to a burner by the draught created by its combustion. The heat produced causes the expansion of a steel tube which, through mechanical magnifying levers, moves a recording pen across the scale. Sudden drops in calorific value due to cracked retorts, &c., are immediately shown, and so also is imperfect gas due to excessive suction. Then there was the "Sigma" automatic calorific value controller, which is an attachment to the recording calorimeter, and by means of which a gas the calorific value of which is higher than is required can be diluted automatically. The function of the controller is to operate a flow governor in the stream of diluting gas. This governor is operated by fluid pressure acting on a piston which moves the valve of the governor. The controller has a small valve which controls the pressure on the piston. When this valve is open there is no pressure on the piston, and a spring moves it to

the zero position, and shuts the flow valve. When the control valve closes, pressure acts on the piston and moves it against the spring, thus opening the valve. The diluting gas is generally the smaller stream. When the rich gas is the smaller stream, the flow governor is placed in this, and a modified control valve opens the governor when the calorific value of the mixed gases falls below the desired value. Other exhibits included " Sigma " gas calorimeters, pressure and differential recorders, and CO_2 recorders. The latter are specially designed for the boiler room, and are of strong construction, and the principle of action is simple. A jet pump sucks the flue gas through the recorder. The stream divides into two paths, and two orifices are in each path. One path includes a vessel containing soda-lime for CO_2 absorption. When no CO_2 is present the pressure in the space between the two orifices is the same in the two paths. When CO_2 is present, the volume of gas is diminished by absorption, and the pressure in the absorption vessel falls, because less pressure is necessary to force the remaining gas through the second orifice. No change of pressure occurs between the two orifices in the other path. The recorder mechanism is connected between the absorption vessel and the corresponding part of the other path; and a fall in the absorption vessel moves the recorder pen.

THE " ROTAMETER."

Mention must be made of the " Rotameter," which was demonstrated by Trost Brothers, of London. This fascinating instrument consists of a vertical transparent tube with the bore tapering towards the lower end. Within the tube a top-shaped float of special design is kept in free rotation suspension by the upward flow of gas or liquid—the meter is capable of measuring both types of fluid—through the tube. The height of the tube indicates directly the actual rate of flow, which is read off on a large accurately-calibrated scale. The tube is secured at both ends in gastight glands in a frame with end-connections for coupling the instrument directly into the pipe line. The two essential components of the instrument—the tapered tube and the float—are entirely unconnected, and do not come into contact. The working principle is simple. The fluid enters the " Rotameter " at the bottom end and leaves at the top. The tube having a taper bore, larger at the top and smaller at the lower end, the constriction represented by the annular space between the circumference of the float and the bore of the tube varies in cross-section according to the position of the float in the tube. The pressure drop is a fixed quantity prearranged to suit the particular conditions under which the individual instrument is required to operate. This pressure drop, which may be as low as 0·2 in. W.G., is determined solely by the weight of the float and its proportions in relation to the tube. It is invariable at all parts of the scale range. The float being entirely free, at any particular rate of flow through the tube it simply takes up such a position in the tube that the annular orifice is just sufficient to pass the flow in question with the fixed pressure drop. The readings of the " Rotameter," state the makers, are accurate to within $\pm$ 2 p.ct. throughout the scale range. The instrument is suitable for any type of main up to 72 in. diameter, and for very high rates of flow in moderate pipe bores. Its many useful applications in gas-works will be apparent.

The firm had also on view a flow-type automatic gas water heater of interesting construction. The gas rate is dependent on the pressure of water flowing through the heater. This pressure, through the medium of a diaphragm, automatically raises or lowers the gas rate; and should the water supply fail, the gas is immediately shut off. A laboratory appliance designed on similar lines was also shown. This would be a useful piece of apparatus for medical men and dentists. The firm supply many types of gas-heated water appliances.

PORTABLE CO_2 TESTER.

The " Eco_2nometer " exhibited by Kelvin, Bottomley, & Baird, Ltd., of Glasgow, came in for much comment by engineers. This is a portable instrument about the size of a pint " Thermos " flask, and not unlike in appearance. It consists of an insulated cylinder, complete with piston, which is in communication with an absorbing medium. The piston rod is calibrated in percentage CO_2. By drawing the piston from the bottom to the top of its stroke a sample of the flue gas is drawn into the cylinder. A manometer then registers at a marked point. The connection to the flue is closed, and the piston is pushed to the bottom of its stroke, thus forcing the gas into the absorbing medium. After circulation, to allow absorption to take place, the piston is drawn to the top of its stroke. The piston rod is depressed until the liquid in the manometer registers as before. The percentage of CO_2 present in the gas is then read-off on the piston rod. The foregoing outline of the principle of working indicates the simplicity of this instrument. Suppose the gas taken has a CO_2 content of 10 p.ct., and there is a certain volume of inert gas in the absorbing chamber. The contents of the whole system are circulated once or twice backwards and forwards through the absorbing chamber, the procedure ending with the piston at the top of the stroke. Since an amount of gas equivalent to 10 p.ct. of the volume of the cylinder has been absorbed, it is clear that if a portion of the piston rod is inserted into the system equal to 10 p.ct. of the cylinder capacity, the missing volume will be restored, and the pressure of the system as indicated on the manometer will be restored to its initial value.

Much of the difficulty of reading the water gauges with modern boilers is due to the great height at which the steam and water drum is placed above the firing floor level. Further difficulty is entailed, with the high pressures in use, owing to the short and erratic life of the gauge glasses, due to the combined effects of high temperature and pressure. For these reasons Messrs. Kelvin, Bottomley, & Baird have brought out the " Pneumercator " distant boiler water gauge, which can be placed in the best position for observation, below, above, or at any reasonable distance from, the steam drum; and as it is charged with cold water, the life of its gauge glass is almost unlimited. With the " Pneumercator " gauge surging is greatly reduced. Another appliance of interest on the stand of this firm was the " K.B.B." smoke and fume warning indicator. This has been designed to give early indications of the production of smoke or fumes, and to indicate at the position of control—for example, inside a boiler room. The attendant is thus able to see when incipient smoke production sets in, and can at once make the necessary adjustments.

THE " DUPLEX MONO."

James Gordon & Co., Ltd., of London, exhibited their well-known boiler-house plant appliances and instruments, including the " Duplex Mono " combustion recorder, the Copes system of automatic feed control, and the " Rheograph " V notch flow recorder. The " Duplex Mono " is a particularly interesting instrument which automatically makes and records thirty gas analyses each hour, recording CO_2 and combustible gases alternately, thus continually indicating to what degree economical combustion is being attained. The operation is briefly as follows: The gas is drawn from the flue, by the suction stroke of a mercury pump, into a volumeter which on the pressure stroke accurately measures the sample, after which the latter is forced through an absorption tank containing caustic potash, where the CO_2 is absorbed. The residue passes into a measuring bell floating in glycerine. As the gas passes into it, this bell turns a balanced wheel which actuates a pen mechanism which indicates the percentage of CO_2. When the mercury pump has completed its pressure stroke, its suction stroke commences, and the measuring bell is put into communication with the atmosphere, and ejects by its own weight the residual gases. On the next stroke of the pump the gas is drawn in as before, but is directed by a valve (operated by water pressure) after being measured in the volumeter, and passed through a small electric furnace where the gases are burnt to CO_2 and water vapour, in the presence of CuO, which supplies any required oxygen. From this furnace the gas passes through the absorption chamber where the water vapour and CO_2 are absorbed. The residue is measured in the bell, and the total percentage of CO_2 and combustible gases is registered on the chart.

" ARCA " APPLIANCES.

A complete range of the various types of relays and regulating valves in different sizes was shown on the stand of British Arca Regulators, Ltd., of London. The relays shown included those for high pressure (up to 300 lbs. per sq. in.); low pressure (25 in. W.G. above and below atmospheric pressure); and temperature and humidity. Special attention was drawn to the relay as used for retort-house governors. Lever-operated and gear-operated valves of the single-seated balanced type, for operation by hydraulic cylinder, and also diaphragm-operated valves were shown. A further interesting feature was the " Arca " automatically controlled steam de-superheater, complete details of which were shown in part section.

OTHER MEASURING INSTRUMENTS.

The Cambridge Scientific Instrument Company had a representative collection of instruments, including electrical CO_2 and CO recorders and indicators, draught and pressure gauges, apparatus for the measurement of temperature, and automatic temperature regulators. A portable instrument was shown which measures the temperature of the flue gases, in addition to the CO_2 percentage.

Working models of pressure and temperature regulators were demonstrated by the Steam Fittings Company, Ltd., of West Drayton; the exhibits including a novel regulator for controlling a steam valve according to both the temperature and the pressure on the outlet side of the valve. A standard relay temperature regulator with all-metal thermostat was shown, in addition to several types of self-acting temperature regulators.

" QUANTAMETER " RECORDERS.

Considerable interest attached to the stand of Quantameters, Ltd., of London, who had exhibits showing sectional and working installations of " Quantameter " remote-indicating and remote-recording instruments for transmitting to any distance an accurate measurement of the quantity of liquid in a tank. Ronald Trist & Co., Ltd., of London, showed the " Thermo-feed " feed water regulator, the " Thermo-feed " differential pump, and the " Hilo " water alarm. The duty of the latter appliance is to warn the attendant when the water level becomes dangerously high, or low, in the boiler. The apparatus is of simple design, and, being fixed outside the boiler, is easily accessible.

(To be concluded.)

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Coke-Cutting Machines.

SIR,—As I have been travelling for the past fortnight, I regret I have not had an earlier opportunity of replying to Messrs. Robert Cort & Son's letter in the "JOURNAL" of Nov. 25.

My figure of 20 p.ct. was an actual works figure; but in fairness to Messrs. Cort, I admit that, at this date, I cannot recollect the makers of the machine used. I would therefore modify the statement which they quote to read: "Coke-cutting and breaking machines . . ." I submit, however, that my argument remains unaltered; for I can assure Messrs. Cort that I have seen their machine—I am not at liberty to say where—cutting hard gas coke, and making a proportion of breeze considerably over 10 p.ct. of the material fed into it.

S. E. WHITEHEAD.

Portsea Island Gas-Light Company,
Portsmouth,
Dec. 5, 1925.

Mr. Milne Watson's Low-Temperature Balance-Sheet.

SIR,—In my letter in the "JOURNAL" for Nov. 18, I drew attention to what appeared to be either an obvious error or an unfair estimate in Mr. Milne Watson's Coalite balance-sheet, which he submitted to the Royal Coal Commission. In the "JOURNAL" for Dec. 2 Mr. Milne Watson does not answer the points raised in my letter, but endeavours to justify his estimate by stating "that the values placed upon the products can be justified by actual experience of some of the larger gas undertakings in the country."

Before any sound opinion can be formed on the correspondence, may I suggest that it is absolutely essential to be correct on fundamentals? To this end, will Mr. Milne Watson be kind enough to state:

(1) Where benzole or spirit can be purchased at 6d. per gallon, as stated by him to the Royal Coal Commission?

(2) If he really expects any business firm to use expensive gas at 4d. per therm for heating low-temperature retorts, as stated in his balance-sheet, when cheap low-grade gas, such as producer gas, can be used equally as well for this purpose, and at a cost of 1½d. or less per therm?

E. HILL.

21, Welbury Drive, Bradford,
Dec. 5, 1925.

REGISTER OF PATENTS.

Carbonizing Pulverized Coal, &c.—No. 231,159.

INTERNATIONAL COMBUSTION ENGINEERING CORPORATION, of New York (Assignees of W. Runge, of Orange, N.J.).

No. 6899; March 13, 1925. Convention Date: March 21, 1924.

This invention relates to the carbonization of pulverized coal, &c., in which the material is introduced into a chamber and descends therein counter to an upwardly moving body of hot gases; the volatile products being withdrawn, together with the body of gases which has been introduced, from the upper portion of the carbonizing zone. Hitherto such methods have been applied to high-temperature carbonization at a temperature rising to about 2000° Fahr., and the present invention applies the method to low-temperature carbonization.

The finely divided coal or other carbonaceous material is introduced and allowed to settle, and is heated by the sensible heat of hot combustible gases having a temperature in relation to the rate of settling such that the coal is carbonized at a temperature not above 1500° Fahr., the gases and volatile products being recovered at an upper region and carbonized residue removed from a lower region of the carbonizing zone. One of the advantages claimed is that the combustible gas used may be producer gas having a calorific value high enough to avoid serious diminution of that of the gases from the carbonizing operation in question.

The specification describes the process in detail; also the design of plant, which is claimed as part of the invention.

High Calorific Value of Fuel from Semi-Coke. No. 241,262.

MARKS, E. C. R., of Lincoln's Inn Fields, W.C. (A Communication from Kohlenscheidungs-Gesellschaft, M.B.H., of Berlin).

No. 16,709; July 11, 1924.

This invention relates to the treatment of semi-coke obtained by the low temperature distillation of fuels; the patentee claiming:

(1) A process for obtaining a combustible substance of high value or an initial product for further treatment in the production of various manufactures, which comprises subjecting the solid products obtained by the low-temperature distillation of fuels, after pulverization to a wet and/or dry treatment for the purpose of removing therefrom the ash-forming and other foreign impurities.

(2) The process in which the product obtained in accordance with Claim 1 is converted into a stable liquefied substance by mixing the same with oil or the like, if necessary with the addition of a so-called protective colloid.

Prepayment Meters.—No. 241,365.

TAUNTON, R. P., and MCINDOE, R. W., both of Birmingham.

No. 22,508; Sept. 24, 1924.

The object of this invention is to enable the prepayment mechanism to be placed in a convenient position without the meter being on view; and this is achieved by providing, in a unit separate from the meter, a prepayment mechanism, comprising a coin-operated ratchet and a price-changer, the mechanism being connected with the meter by a suitable coupling, such as a "Bowden" flexible cable.

This separate unit may incorporate, in addition to the coin-actuated ratchet mechanism and price-changer, the setting mechanism for the cut-off valve, and, if desired, also the cut-off valve, in which case it would be necessary to carry piping to and from the meter. Either of the above combinations may be suitably arranged in a casing comprising the usual money box.

A feature of the invention is the incorporation with the prepayment mechanism of a clutch device adapted to be brought into action when a coin is inserted in the slot of the price-changer.

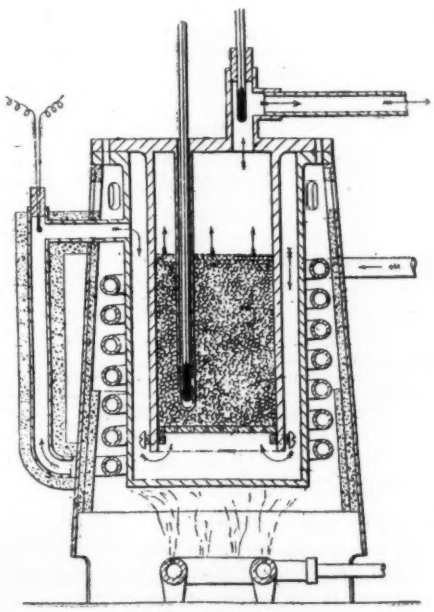
Assay of Volatiles.—No. 241,659.

NIELSEN, H., of Muswell Hill, and LAING, B., of Hatfield.

No. 19,769; Aug. 20, 1924.

This invention is for a portable apparatus in the nature of a miniature retort for assay or experimental work in estimating the nature and volatile constituents of liquid or solid carbonaceous materials. It is suitable where the material in bulk is to undergo treatment in retorts in contact with an inert gas such as water or producer gas, whose sensible heat is employed to effect distillation.

We reproduce a sectional elevation of one form of the apparatus claimed. It will be seen that there are inner and outer chambers concentrically fixed, and a coil surrounding the latter. Through the coil circulates the heating medium—steam or combustion gases, or an inert gas such as hot producer or water gas—which is afterwards admitted to the space between the chambers. Thence it passes through preparations in the base of the inner chamber, through the material, and to the off-take together with the volatile constituents. A gas burner may be provided to superheat the gas as it enters the inner chamber. Thermometers or pyrometers are disposed as shown in the drawing, and the outer shell of the whole apparatus is lined with asbestos or other heat resister.



A Compact Assay Apparatus.

Modified apparatus for dealing with liquids is described and illustrated.

Gasholder Crowns, &c.—No. 241,481.

MILBOURNE, R. J., of Lilleshall, and CUTLER, S., of Victoria Street, S.W. 1.

No. 12,787; Dec. 29, 1924.

This invention relates to the crowns of circular gasholders, tanks, and the like, for which the trusses are normally of uniform strength throughout their length, whereas the weight of permanent load carried by them is a gradually diminishing one from the periphery, where the stress due to bending moment is at its maximum, to the centre of the crown where that stress is at its minimum.

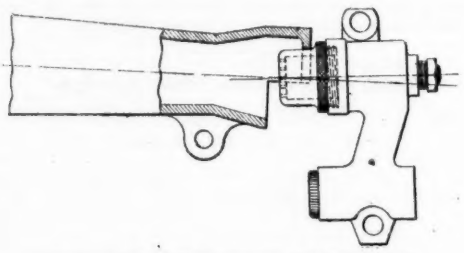
The present invention consists in constructing the truss of varying strength to conform with the bending moment stress diagram of the loads to be carried. Thus, the truss is deepest and strongest where the greatest load has to be carried. Further, since the loads to be carried by the radial trusses, though always greatest towards the periphery of the crown, may vary in position and degree in various circumstances of snow and wind loads, &c., counterbraces or cross ties may be provided between certain points of the truss.

Burners.—No. 241,699.

RADIATION, LTD., of Birmingham, and YATES, H. J., of Grosvenor Place, S.W. 1.

No. 23,704; Oct. 7, 1924.

This invention relates particularly to gas-fire burners in which normally the axis of the gas stream coincides with that of the portion of the mixing tube adjacent to the gas jet. For some purposes it is desirable to cover the upper side of the free air space between the jet and mixing tube by means of a hood; but it is found that this is accompanied by a disadvantage in that the aeration is diminished. A similar result is found in all cases where air is admitted at one side of the injector.



Improved Gas-Fire Burner.—Radiation, Ltd.

The object of the present invention is to minimize this disadvantage in a very simple and effective manner. A hood is used over one side of the inlet, or the air is caused to enter at one side of the mixing tube; but the axis of the gas stream is inclined to, or displaced from the axis of, the mixing tube in the direction of the air inlet side.

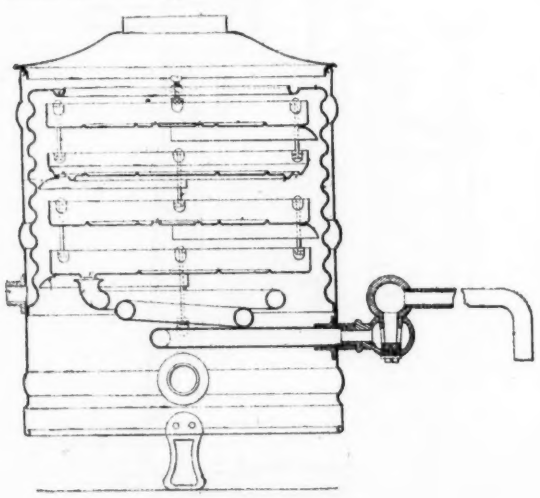
The accompanying drawing illustrates diagrammatically one manner of applying the invention.

Geysers.—No. 241,727.

ALDAM, E. H., of Stamford Street, S.E. 1.

No. 27,100; Nov. 13, 1924.

The geyser covered by this invention is of the type in which the water is introduced near the bottom. Its general design is clear from the section which we reproduce.



E. H. Aldam's Geyser.

The geyser comprises essentially a sheet-metal casing of any desired shape, an inner corrugated lining adapted to form a water jacket with the casing, an inlet for cold water at the base of the jacket, and a plurality of flanged trays contained within the casing and arranged one above the other, each tray being formed with staggered ridges so arranged as to cause the water to be broken or dispersed on its surface, and to travel in an opposite direction to that in the tray above. In communication with the bottom tray is a pipe coiled immediately below it and through which the water passes to an outlet pipe, which is preferably made to swivel.

Coking Retort Ovens.—No. 241,991.

RUSHEN, P. C., of Chancery Lane, W.C. 2. (A communication from the Koppers Company, of Pittsburgh.)

No. 18,248; July 30, 1924.

The specification points out that, in ovens with high and narrow retorts, the heat is applied laterally at the vertical sides and the coking of the charge begins at the side surfaces and progresses inwardly; the central portions of the charge remaining in a sticky, incompletely coked condition after the side portions are fully carbonized. Heretofore the injection of steam has been either at the centre or at the sides of the retorts; in the first instance the steam immediately encounters the sticky incompletely coked layers, and in the second instance, owing to the shrinkage of the charge which takes place with many kinds of coking coals, undecomposed steam passes upwardly into the gas of distillation. In both instances there is therefore imperfect realization of the water gas reaction, and the coal gas is liable to contain an objectionable amount of water vapour.

The arrangement claimed consists in applying a coking heat laterally to the opposite vertical walls of the chamber, and, during the latter portion of the coking period, injecting steam through the bottom of the mass of such material on each side of its longitudinal centre in a manner to cause it substantially to penetrate the outer or coked sides only of the carbonaceous material. The invention combines ports, for admitting the steam, located wholly or mainly in the bottom wall of the chambers between the longitudinal centre line and a side thereof, for the aforesaid purpose.

Further details are fully described and claimed in the specification.

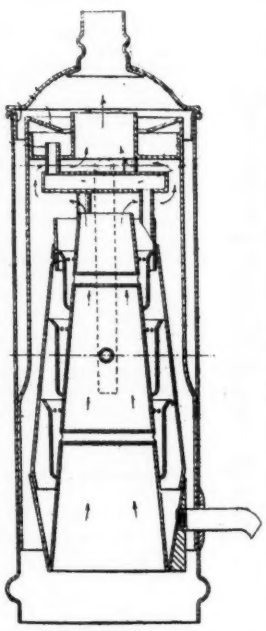
Geysers.
No. 242,066.

REYNOLDS, J. E., of Camberley.

No. 25,517; Oct. 27, 1924.

The construction of geyser to which this invention refers is indicated in the sectional drawing we reproduce. It comprises a main heating element consisting of a plurality of superimposed annular cup members arranged round the surface of a hollow conical flue, and a preliminary heating element for heating the water before it passes to the main heating element.

The feature of the invention is that the preliminary heating element includes a hollow baffle plate through which the water circulates before passing to the main heating element, the baffle plate being of greater diameter than the open upper end of the conical flue. Thus the heating gases strike the baffle plate after leaving the flue cone and become splayed out by it, effecting an efficient heating of the water contained therein.



Reheater in a Geyser.

Distillation of Coal.—No. 242,435.

NEATH, J., of Staines, and CHANEY, W., of Bishopsgate, E.C. 2.

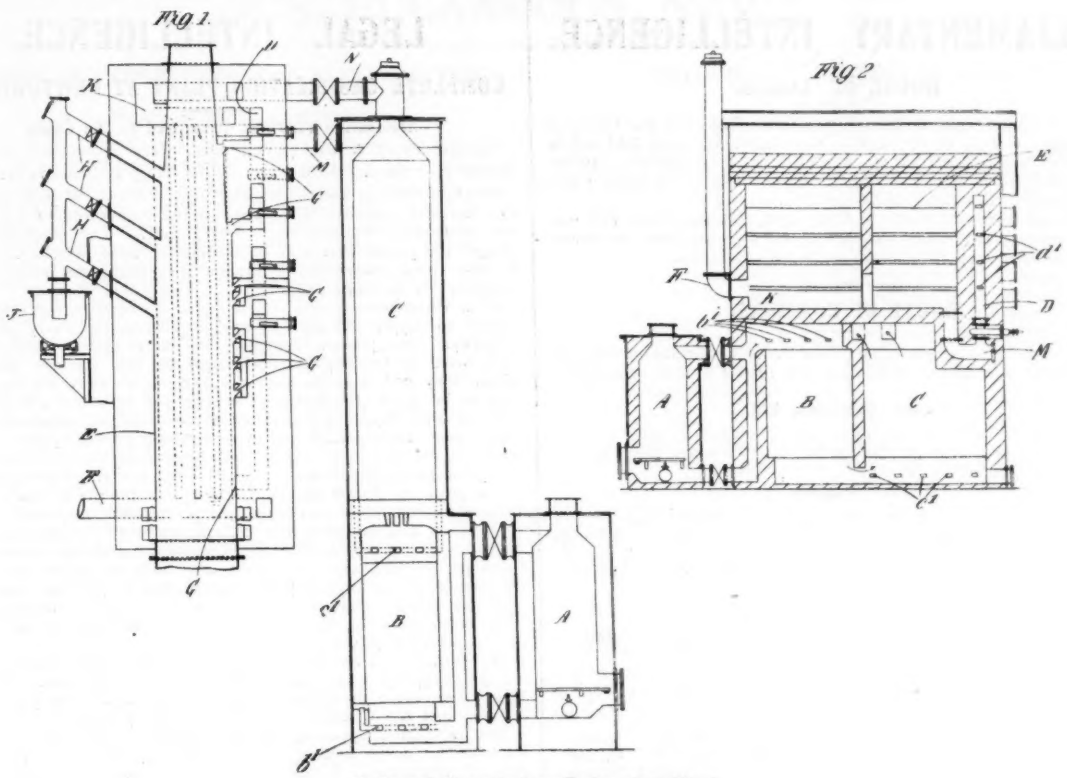
No. 26,718; Nov. 8, 1924.

This invention relates to low-temperature carbonization—notably, to the kind of retort settings in which a regenerator is interposed between producer and retorts; producer gas and water gas being alternately led through the generator.

According to this invention the producer gas is burnt in the regenerator by successive additions of secondary air; the existing carburettor or superheater acting as a regenerator; the hot waste gases or products of combustion from the regenerator passing round the retorts. Then, after the secondary air ports have been closed, water gas is admitted to the regenerator and heated, and passes to a distributing chamber, from which it can be distributed to different retorts or different parts of the length of a retort or retorts. A cooling chamber may be provided into which the smokeless fuel from the retorts is discharged, and air for the gas generator is passed through this chamber to be preheated by absorbing sensible heat from the smokeless fuel.

Fig. 1 represents in vertical section a portion of a continuously operating vertical retort installation; and fig. 2 a portion of a horizontal retort installation.

A indicates the producer, B and C indicate two chambers of a regenerator which are provided with secondary air ports b^1 c^1 and are



Neath and Chaney's Low-Temperature Plant.

filled with chequer bricks, D a distributing chamber for water gas, E retorts, and F the outlet for blow gas to the main flue. In the case of the vertical retort, the water gas coming from the chamber C through the pipe M enters the retort through any or all of a series of inlets G at one side of the retort, and the combined water gas and coal gas pass off by the pipes H at the opposite side to the hydraulic main J. The pipe N carries the blow gases to the combustion chamber K.

In the horizontal plant, fig. 2, secondary air ports are provided at b^1 and c^1, the blow gases taking the course indicated by the arrows to the combustion chamber K, whence the spent blow gas passes to the exhaust pipe F. When water gas is being made, the secondary air ports and the connection between the combustion chamber and exhaust pipe are closed. The water gas entering at M after passing through the setting is admitted by opening suitable valves or dampers in the distributing chamber D, whence it passes through ports d^1 to a hole in the top of each retort and traverses the retort, then passing with the coal gas to an ascension pipe (not shown).

Charging and Discharging Retorts.—No. 242,369.

CANNING, T. F., and CLARK, R. G., both of Southend-on-Sea.

No. 19,429; Aug. 16, 1924.

No. 22,353; Sept. 22, 1924.

This invention differs from previous charger-dischargers in that the chain, which has side arms or pushers, travels over a central linked bar on its upper edge, and on the underside travels on the floor of the retort, thus dispensing with sectional troughs.

The main features of the design will be understood from the drawings we reproduce.

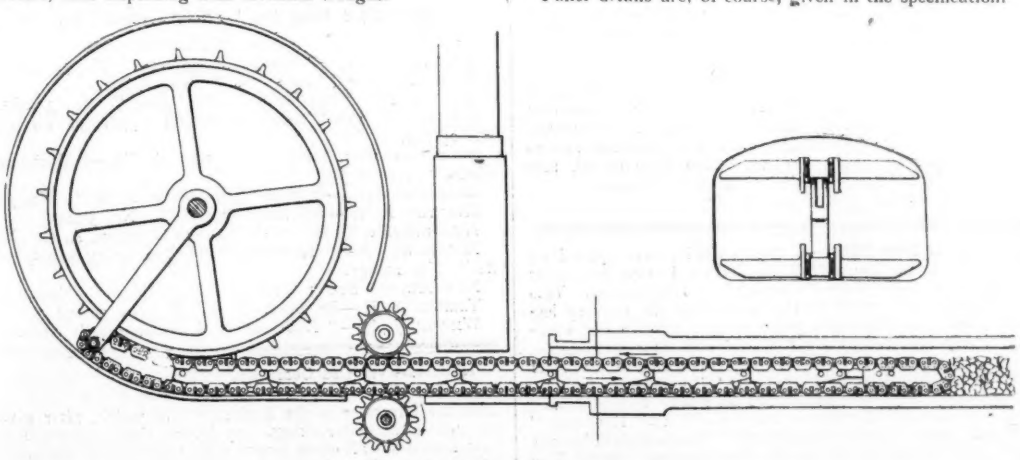
The discharging-charger comprises two main parts, one of which is a linked bar and the other an endless chain adapted to travel lengthwise both with and in relation to the linked bar and to carry the pushers. This endless chain may run over a wheel at either or both ends of the bar, and the construction is such that if the bar is moved lengthwise and the chain or cable is held on its under side, the upper side will travel in relation to the bar.

In practice, the linked bar is pushed into the retort; and the pushers, which are then stationary in relation to the bar, convey the coal from the mouth of the hopper into the retort. When the full charge of coal is in place, the linked bar is withdrawn, the chain being held on its under side (say, near the mouth of the retort) with the result that the inner part of the chain will move from under the bar over its end and back along the top, while the outer part will have reverse movement. The pushers on the chain will rise almost vertically from under the bar at its inner end, and will not appreciably disturb the coal.

It is preferred to make the links lozenge-shape, to facilitate their fitting with the chain round the wheel; or they may be pivoted to each other vertically so as to fit to a flat-sided wheel on a vertical axis.

It will be seen that the coal is thus carried into the retort by the extending bars or plates on the endless chain, which travels inwardly *en bloc* with the linked bar and at the same speed; but when the linked bar is withdrawn, the chain with its bars or plates has relative movement with the linked bar. The chain rests on the bottom of the retort, and acts as a rubbing strip for the linked bar. The endless chain or cable may be driven for the purpose of withdrawing the linked bar.

Fuller details are, of course, given in the specification.



Canning and Clark's Charger-Discharger.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following Special Orders proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act were laid before the House and referred to the Special Orders Committee: Audley U.D.C., Sidmouth U.D.C., Tamworth Gas Light and Coke Company, Worthing Gas Light and Coke Company.

The Campbeltown Harbour and Gas Order Confirmation Bill was read a second time, deemed to have been reported from the Committee, read the third time, and sent to the Commons.

HOUSE OF COMMONS.

The Campbeltown Harbour and Gas Order Confirmation Bill was brought from the House of Lords, and read the first and second time.

Smoke Abatement Bill.

A Bill to amend the law relating to smoke nuisances, and for other purposes, was presented by Dr. Salter, on Tuesday, Dec. 1, and ordered to be printed.

Gas Mantles.

Replying, on Dec. 1, to Mr. Montague, who desired to know the volume and the value of the imports and exports of gas mantles for 1913, 1923, 1924, and for the first ten months of 1925, Sir P. Cunliffe-Lister had circulated in the Official Report the following table:

—	1913.	1923.	1924.	1925. Jan.-Oct.
	I.—Quantities.			
		Gross.	Gross.	Gross.
Total imports	*	209,858	165,527	175,349
Re-exports	*	1,917	855	553
Net imports	*	207,941	164,672	174,796
United Kingdom exports	*	20,201	23,105	16,242
	II.—Declared Value.			
	£	£	£	£
Imports	302,576	201,323	160,596	188,109
Re-exports	5,650	2,982	1,156	802
Net imports	296,926	198,341	159,440	187,307
United Kingdom exports	32,566	49,145	48,508	32,739

* Not recorded by quantity in this year.

NOTE.—Since April 1, 1923, the trade of Great Britain and Northern Ireland with the Irish Free State has been included. From the same date the direct foreign trade of the Irish Free State has been excluded.

Duty on Gas Mantles.

The House sitting in Committee on Ways and Means, under the chairmanship of Mr. J. Hope, considered, last Thursday, the question of a duty on gas mantles, when Sir P. Cunliffe-Lister moved that during a period of five years from the passing of the Act duties should be charged on the importation into Great Britain or Northern Ireland of mantles for incandescent lighting, whether collodionized or not, at the rate of 6s. the gross, and on impregnated hose or stockings for use in the manufacture of such mantles at the rate of 4s. 6d. the pound. He said the fact that the gas-mantle industry provided the only serious commercial outlet for compounds of thorium and cerium justified the proposal on the ground that it concerned a key industry.

Mr. WIGGINS moved as an amendment that the duration of the duties should be one year instead of five years. He maintained that it was unfair that users of gas mantles should have to bear the whole burden of protecting the two chemicals, thorium and cerium. This meant that the poorer people, who had to depend on gas, would have to bear the cost of the duty.

Mr. LEES-SMITH said the report on gas mantles was the most peculiar of the series. The Committee reached the conclusion that the gas-mantle industry had not established their case that they were suffering from unfair foreign competition, but had nevertheless recommended, on considerations which were not before them at all, that there should be a tariff for the protection of certain chemicals.

The resolution was carried by 175 votes to 87.

Gas Exhibition at New Mills.—A gas exhibition was opened on Monday last, Dec. 7, at the Town Hall, New Mills, Derbyshire, under the auspices of the Urban District Council Gas Department. This event is to run during the whole of this week, and the cookery lectures and demonstrations which are given every afternoon and evening are being closely followed by large numbers of interested people. The display of gas apparatus is tastefully set out; one of the chief centres of attraction being Richmond's popular "Bungalow" cookers, which are supplied by the Gas Department on simple hire and fixed free. Conspicuous also on Richmond's stand are their "Ranelagh" and "New World Junior" cookers, also their "Marlborough" series of fires, which are available on favourable hire-purchase terms. The exhibition has been well attended each day, and should prove highly successful in promoting the interests of gas in New Mills.

LEGAL INTELLIGENCE.

COMPLETE GASIFICATION PLANT AT NEWTOWNARDS.

Arbitration Findings Submitted to the Court.

Messrs. Perry & Co. (Bow), Ltd., were respondents in a case before Mr. Justice ROWLATT, in the King's Bench Division, on Thursday, Dec. 3, concerning the supply of two of their plants for the complete gasification of coal to the Newtownards (co. Down) Urban District Council in October, 1921. The Council, having alleged the plants were useless, the matter went to arbitration; and it now came before the Court on a special case stated by the Umpire, Sir Richard Paget.

In a voluminous award, the Umpire stated that the respondents agreed to supply and fix two 250,000 c.ft. a day Perry plants for £13,017. The plants, arranged for the complete gasification of coal, were in the experimental stage, as this was the only place where they had been so used commercially. They did not enable coal to be gasified completely; and a gas of about 450 B.Th.U., such as was required, could not be economically obtained directly from coal. Both parties had evidently been misled by the sanguine anticipations of their engineers. Owing to complete failure of the plant much labour was imposed upon the claimants; and they lost a profit of £1800 during the year that the plant was in operation. The blue water gas which the plants were originally designed to produce was of too low a calorific value to be suitable for the purposes of the Council. The Umpire accordingly awarded (see "JOURNAL" for Aug. 26 last, p. 499) that if certain letters and documents in the case were admissible, the respondents should return the £10,775 paid to them by the claimants. If the documents were not admissible, the respondents were entitled to the balance of the purchase price.

Mr. WHITTAKER, for the claimants, said the Council contended that the gas supplied was totally useless for their purpose. The case now came before the Court on questions of law. The plant was a failure; and the Council wanted their money back.

His LORDSHIP, speaking of the involved nature of the award, remarked: "Some institution ought to be provided for the education of arbitrators. I absolutely cannot disinter from this award the questions to be decided."

Sir MALCOLM MACNAGHTEN, K.C., for the respondents, said the question was really a simple one—namely, the true construction of the contract. The firm were given to understand that the Council required a low-grade gas, whereas they really needed a gas of 500 B.Th.U.; and therefore the plant was quite unsuitable for Newtownards. It could not possibly produce gas up to their requirements; and the question for the Court was whether, under the contract, the firm or the Council were liable. There could not be any complaint as to the plant being faulty; for it was as perfect as it could be. Water gas could only be obtained up to 312 B.Th.U.; and by complete gasification of coal they could only get up to 360 to 380 B.Th.U. This plant gave gas up to 350 B.Th.U., which was a very good performance. This was primarily a water gas plant, and everybody knew it; but it could also be worked for complete gasification of coal. Had the firm known that the Council wanted gas of 500 B.Th.U., they would never have supplied this plant.

Mr. WHITTAKER replied that the respondents knew that the Council wanted gas of over 400 B.Th.U., but the plant was not capable of producing it.

After an adjournment,

His LORDSHIP, in giving judgment, said the award was so mixed-up and involved that he was not certain that it was possible to deal with it, and whether the whole thing was not bad. There was no evidence that respondents contracted to supply a plant which would enable the Council to satisfy the statutory requirements. An accessory part of the plant—an extractor—was never even tried. Therefore he held that the contractors discharged their obligations, and Council must pay them £2242, the balance of purchase money, with interest.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 2.]

Nos. 29,467-30,134.

ANDREWS, W. F.—"Gas-heated geysers." No. 30,091.
BEJAR, A. DE.—"Gas stoves." No. 29,809.
DANGER, H.—"Gas-heated bakers' oven." No. 30,080.
EDGAR, W. R.—"Distance control apparatus for gas lamps." No. 29,782.
FARBENFABRIKEN VORM. F. BAYER & Co.—"Carbonization processes." No. 29,937.
GLASGOW, A. G.—"Water gas generators, &c." No. 30,013.
HELLYER, R. H.—See Andrews, W. F. No. 30,091.
HUMPHREYS & GLASGOW, LTD.—See Glasgow, A. G. No. 30,013.
MATTHEWS, A.—"Thermostats for regulating supply of coal gas, &c." No. 29,957.
NEW METHOD STOVE COMPANY.—"Radiants." No. 29,509.
TARPER, A. H.—See Andrews, W. F. No. 30,091.
WILSON, J. H.—"Lubrication of gas meters." No. 29,878.

Aberystwyth Gas Company.—This Company, of which Mr. Henry Woodall is Chairman, have published a booklet entitled "A Message from the Directors to the Residents," in which, after giving a short account of the undertaking, they inform their consumers that for the next four years all extra profits will be devoted to the lowering of the price of gas. That these extra profits may be more assured, the shareholders promise to ask for no increase in dividends, and the Directors decline to take any addition to their fees.

MISCELLANEOUS NEWS.

GAS LIGHT AND COKE COMPANY'S STANDARD PRICE.

L.C.C. Report on Revision Application.

The Gas Light and Coke Company have given notice that they have applied to the Board of Trade, under section 1 (3) of the Gas Regulation Act, 1920, for an Order to increase the Company's standard price of gas from 11d. to 11·4d. a therm; and the London County Council, as one of the local authorities affected, have the right of submitting representations, if they so desire. The Public Control Committee therefore considered the matter, and as a result submitted the following report and recommendation at yesterday's meeting of the Council.

The standard price applicable to the Gas Light and Coke Company was fixed by the Board of Trade in 1921 at 15·2d. a therm. and on Dec. 22, 1923, on the application of the Council, the Board made an Order reducing, as from Dec. 31, 1923, the standard price to its present level of 11d. a therm. As a result of this last-mentioned reduction, the authorized dividend on the Company's ordinary stock fell from £7 9s. 4d. p.ct. in 1923 to £5 6s. 8d. p.ct. in 1924; the latter rate being somewhat higher than the pre-war dividend. The authorized dividend for the year 1925 will be £5 1s. 4d. p.ct.; and the effect of the increase of 0·4d. a therm in the standard price asked for by the Company would be to increase the Company's present authorized dividend by 5s. 4d. p.ct. per annum.

The Committee have given full consideration to the matter, with such figures and estimates as are available; and they have been advised thereon by Mr. Arthur Valon, M.Inst.C.E., who has assisted the Council in former gas inquiries. The method adopted by the Company in arriving at the increased cost of supply of gas on which their application is based is to compare an estimate of the present cost of supply with an estimate prepared by them in connection with the revision of standard price in 1923. The Committee are not satisfied that this method is a proper one. It should also be pointed out that the present figures for an estimated year are calculated, not on the present output and present quality of supply, but upon output and quality as obtaining in 1923. Apart from an allowance for the increase in wages which has taken place since 1923, the estimates show, for every item except the net cost of coal, the same cost for 1000 c.ft. of gas as was calculated in the estimate of 1923. The effect is that all reductions in cost due to increase in output are treated as reductions within the control of the Company.

The Committee are advised that the increase of standard price proposed by the Company could probably be justified in the present circumstances; but it appears to them that there is a strong possibility that the economic conditions which are likely to prevail in the not distant future may require an early reconsideration of the standard price if the Company's application is granted, and they feel that any decision that may be come to on the present application should have regard to this consideration. They accordingly suggest that the Council should not oppose the proposed increase of standard price, but that it should be made clear to the Board of Trade that, in refraining from such opposition, the Council are not to be taken as agreeing to the method adopted by the Company for calculating the increase in cost of supply as shown in the schedule deposited with the application or with the figures in their estimate of present cost, and generally that, by refraining from opposition in this case, the Council should not be prejudiced as regards future applications for alterations of standard price.

The Committee recommended:

That, in connection with the application of the Gas Light and Coke Company to the Board of Trade for an Order under section 1 (3) of the Gas Regulation Act, 1920, to permit of an increase in the Company's standard price of gas from 11d. to 11·4d. a therm, representations be submitted to the Board to the effect that, while it is not desired to offer objection to the application of the Company, (i) the Council do not agree with the method of calculation adopted by the Company in determining the increase in the cost of supply, nor (ii) with the Company's figures in their estimate of present cost, and (iii) that, in refraining from opposition, the Council should not be prejudiced as regards future applications by gas companies for alterations of the standard price.

Turin Gas-Works.—It is understood, says an Exchange Telegraph message, that the Power Securities Corporation and the Turin Gas-Works have signed an agreement following which the gas-works will issue $5,000,000 in bonds for the purpose of increasing the capital to 130,000,000 lire. The bonds will be sold in the United States.

Price of Gas at Hartlepool.—The West Hartlepool Corporation and the Hartlepool Gas and Water Company are in disagreement over the price charged for gas. At a meeting of the Corporation on the 1st inst., reference was again made to the increase in price, and strong criticism was forthcoming of the Company's action in refusing to receive a deputation. A resolution was agreed to that the Company should be again urged to do so. The Property and Lighting Committee reported that the Company had stated that, in the opinion of the Directors, no good purpose would be served by an interview, as they were unable to add anything to what was stated in a letter to the Council on Oct. 24. The notice they published explained the cause of the increase. Although gas was a primary product resulting from the carbonization of coal, residuals were a most important factor affecting the price of gas, and the market value of all residuals was at present very low. The Directors were fully alive to the necessity of keeping the charge for gas down to the lowest possible figure, in the interests of both the Company and the consumers, and intended to continue to supply gas of a good quality at a fair price.

SEAFORD GAS COMPANY INQUIRY.

Application for Special Order.

An application by the Seaford Gas Company for a Special Order authorizing them to supply gas (in addition to the urban district of Seaford) to the parishes of Alfriston, Alciston, Litlington, Lullington, and West Dean, to such parts of the parishes of Berwick and Selmeston as lie south of the Southern Railway from Lewes to Eastbourne (all in the rural district of Eastbourne), and to such parts of the parish of Bishopstone as lie on the east of an imaginary line drawn true north and south through the south-eastern corner of the pumping station of the Newhaven and Seaford Water Company, was the subject of a Board of Trade inquiry held at Steyne Hall, Seaford, on Tuesday, Dec. 1.

The inquiry was held by Mr. J. F. RONCA, O.B.E. Mr. ROWAND HARKER (instructed by Mr. Leslie C. Wintle) was Counsel for the applicants. Mr. C. E. BAKER represented the Seaford Urban District Council; Mr. F. G. SCOTT, the East Sussex County Council; Mr. R. W. FOVARGUE, the Eastbourne Rural Council and the Commissioners of Sewers for the levels within the Rapes of Pevensey and Hastings; and Mr. J. MORAN, a local resident, who also opposed the application, was present in person.

Mr. ROWAND HARKER, in outlining the case for the Company, said the Order made the usual provision for additional capital to be sold by auction, and asked for authorization for differential charges for the parishes outside the urban district of Seaford. The application was to put upon the Company that, within nine months of the date of the Order, they should supply gas on a thermal basis instead of per 1000 c.ft., and to enable them to make certain additional charges. He then proceeded to give a history of the Company, which, he said, was established in 1863 by a resident named Thomas Crook. The works were carried on as a private undertaking; and the local authority were supplied with gas for street lighting. As the Seaford Urban District Council had pointed out in their objections, this supply had only been possible, and had only been given, by the mutual goodwill and co-operation of the private undertakers and the Council. The latter body realized that they were acting quite unlawfully in allowing private undertakers to break up the public streets. It was partly owing to this that it was advisable for everybody that statutory powers should be granted to the Company. After the death of Mr. Crook in 1873, the Company was incorporated in 1906. It was anticipated that before long the mains would extend beyond the boundaries; and in this event it would be possible to supply the villages named. Neither the Eastbourne nor the Lewes Gas Companies opposed the application; and the Newhaven Company had agreed that the request was a perfectly reasonable one. There were about 1000 residents in the parishes of Bishopstone and Alfriston together; and it was hoped that before long it would be an economic proposition to supply these people. Speaking as to the proposed standard price, Mr. Harker said that, having regard to the cost of manufacture and distribution, and to proper economy and efficiency and a fair return on the capital involved, the standard price would work out at 71·91d.; and after consideration, it had been agreed to fix it at 6s. 3d. per 1000 c.ft. They had only received one complaint from a private individual, who stated that his property had deteriorated in value owing to the smell and fumes from the works; but it was noticed that this gentleman had secured the freehold of his property. The objections of the Seaford Urban Council had all been met; but the Eastbourne Rural District Council and the East Sussex County Council had objections to certain clauses in the Order. The latter body complained that the Order made no adequate provision for the protection of the roads under their control; but Mr. Harker reminded the Inspector that the Board of Trade did not usually give County Councils any protection other than that which they secured under the Gas-Works Clauses Act. With regard to the objection of the Commissioners of Sewers for the levels within the Rapes of Pevensey and Hastings, they pointed out that they had jurisdiction over part of the area of supply the Company were seeking, and asked for protection. Mr. Harker pointed out that the Gas Company did not wish to interfere with any water courses.

Mr. *William Cash* (a member of the firm of Messrs. Cash, Stone, & Co., who are Auditors to the Company) gave details as to the financial position of the undertaking. On the original capital, he said, the promoters suggested a standard 7 p.ct. dividend, which, he thought, was quite reasonable, and 7 p.ct. on the additional capital if issued as ordinary capital, and 7½ p.ct. if issued as preference capital. In addition to the £10,000 of 6 p.ct. first mortgage debentures, the Company had a bank overdraft of £5000, secured by 5000 6 p.ct. debentures. Dealing with the price of gas, he said it was reduced to 6s. 3d. per 1000 c.ft. in 1924; and this was the price being charged to-day. In all the circumstances, he thought it was only reasonable that the Company should be given a 7 p.ct. standard rate of dividend—especially as they were giving up an unrestricted right to charge for gas such price as they might consider desirable. With regard to the 7½ p.ct. preference dividend, any issue of preference capital was subject to the auction clauses. As drawn, the Order did not provide for any revision of standard price.

Mr. *A. A. Johnston* (Consulting Engineer to the Company) gave details respecting the plant at the works, the capacity of which, he said, was approximately 62,000,000 c.ft. per annum. Seaford was developing in a north-easterly direction; and he considered it would be an economic proposition to supply the villages named. If, however, a differential rate was not sanctioned, the chance of those places obtaining a supply of gas was very remote. In his opinion, the works could not be replaced under at least £1500 per million c.ft. per annum; and, on last year's output, this would give a sum of

£68,500. That was a very moderate estimate of value. Mr. Johnston gave particulars of the additional capital which would be required for developing the business, and emphasized the reasonableness of the differential price proposed to be charged in the rural area.

Mr. *L. D. Mosley* (Engineer and Manager to the Company) said they were seeking powers to break up roads for the purpose of laying ancillary pipes, which would be a great convenience for the purpose of distributing their supplies to other authorities for generating power. The present mains went to within 200 yards of Bishopstone; and the village was about 1¼ miles away.

Mr. Scott, on behalf of the County Council, said that body had no desire to prevent the supply of gas, but wished to protect their main roads. The other outstanding points were the standard rates of dividend, the price and quality of the gas, and the amount of capital. They thought 7½ p.ct. for preference shares was rather high; 6 p.ct. being the usual dividend allowed, except in special circumstances, which he contended did not exist in this case. He did not think the County Council would obtain a protective clause for their main roads, because this would be creating something like a precedent; but they wished to reserve their rights in regard to the main roads under their control. In the event of the roads being widened, he contended that the gas mains would have to be moved at the expense of the Gas Company. With regard to the bridges, it had been the practice rather than otherwise to obtain a protective clause; and the County Council were probably more concerned with the bridges than with the main roads. He therefore submitted that the Board of Trade should grant the protective clauses asked for.

Mr. Fovargue said the district he represented would be only too pleased to obtain a supply of gas, if their needs were equitably considered. They wanted some guarantee that the supply was coming, and suggested that five years was a reasonable time within which the Company should carry out the undertaking. As to the Commissioners of Sewers, unfortunately the existing Acts did not give them the necessary protection.

Mr. Moran stated that his reason for opposing the Order was that the value of his property would deteriorate.

Mr. Rowand Harker having replied to various points raised, the inquiry closed.

COLONIAL GAS ASSOCIATION.

Annual General Meeting.

The 37th Annual General Meeting of the Association, which was held in Melbourne on Oct. 7, was presided over by Mr. P. C. Holmes Hunt.

The Chairman, moving the adoption of the report and accounts, said the statement was a satisfactory one. The quantity of gas sold in the year ended June 30 was 434,399,000 c.ft., as compared with 352,142,000 c.ft. in the previous twelve months (which, however, included only six months' results from the Williamstown Works). The result of the revenue account was a transfer to net revenue of £47,343, as against £36,629 a year ago. Allowing for the interim dividend and interest and income-tax charges, the amount available was £33,058, as compared with £29,999. There had been an increase in capital in order to finance various necessary extensions—including new holders at several works. Following upon the amalgamation with the Williamstown Gas Company, it had been decided to modernize the Footscray Works, and to supply Williamstown and Footscray from the reconstructed manufacturing station. With this end in view, a contract had been placed with West's Gas Improvement Company, Ltd., for an installation of Glover-West vertical retorts of the most modern type. An endeavour was being made to have the carbonizing plant in operation in time to supply the winter demand in 1926. When the new installation was in commission, the closing of the works at Williamstown would be feasible; and the saving effected would more than meet the interest on the expected capital outlay. When this reconstruction was completed, and the plant was in successful operation, the Directors hoped to be able to make an appreciable reduction in the price of gas supplied in the Western Suburbs of Melbourne. Pointing out the remarkable growth of the industry generally, the Chairman said that in Australia before the war the yearly quantity of gas sold was 10,132,000,000 c.ft., which had on the latest returns grown to 17,627,000,000 c.ft.—an increase of over 75 p.ct. in ten years. Taking a conservative estimate, there was invested today in gas undertakings in Australia about £15,000,000, consisting of shares, debentures, and reserves.

The report and accounts were adopted, and the Board were congratulated on being able to put forward such a highly satisfactory balance-sheet.

Dividends were declared of 8 p.ct. per annum on the preference shares and 9 p.ct. per annum on the ordinary shares, £4000 was added to reserve, £4000 set aside for Australian income-tax, and £11,623 carried forward.

Thereafter the meeting sanctioned an increase of capital by the creation of 25,000 additional £1 ordinary shares and 45,000 additional £1 8 p.ct. preference shares.

During the frosty weather there has been trouble with naphthalene deposits in the mains at Warrington; and the Gas Committee have given their Engineer authority to construct a naphthalene washer at a cost of £200.

The British Gas Light Company, Ltd. (per Mr. Henry Woodall) are among the latest donors to the Leeds University Extension Appeal Fund. The Company's gift, in the lists of last week, was £100. The aim of the appeal is £500,000; and up to the past week-end the total had reached well over £230,000.

KNOTTINGLEY GAS ORDER.

Mr. J. F. Ronca (the Director of Gas Administration) held an inquiry, at the Offices of the Board of Trade, on Tuesday, Nov. 24, into the Knottingley Gas Company's application for an Order under section 10 of the Gas Regulation Act. A purpose of the Order is to consolidate capital, and there are a number of miscellaneous provisions of a domestic character.

The only opposition was by the Knottingley Urban District Council, represented by Mr. C. E. Baker (Messrs. Baker & Co., Parliamentary Agents). The Urban District Council consume the Company's gas for the purpose of street lighting, and at present there is an agreed provision in a previous Order of the Company granting a discount of 10 p.ct. to the Council, in view of the large quantity of gas consumed, and in respect of prompt payment. In the present Order it is proposed to amend the discount clause so that it will only apply "so long as the Knottingley Urban District Council shall not adopt or use electricity for the purposes of public lighting." The Council opposed that amendment.

Mr. W. Bentley (Solicitor to the Company) said that the Company allowed a discount of 2½ p.ct. to ordinary consumers for prompt payment, and the 10 p.ct. discount granted to the Urban District Council included that 2½ p.ct. In view of the fact that electricity was to be supplied in the district, the Company feared that it would be used instead of gas for street lighting. The effect of this would be to reduce considerably the consumption of gas by the Council, and, inasmuch as the 10 p.ct. discount was given because the quantity of gas consumed was large, the Company could not be expected to continue to pay the discount in respect of a much lower consumption. The Company had no wish to control the Council with regard to the particular illuminant they employed for street lighting. The agreement to pay the 10 p.ct. discount was made in 1912, when the conditions were different from those existing at the present time. A large generating station was being constructed by the Yorkshire Electric Power Company at Ferrybridge, which adjoined Knottingley, and it was understood that the Urban District Council contemplated using electricity for public lighting. The Company did not wish, of course, to prevent the Council using electricity for this purpose. The township of Knottingley had two main streets, the remainder consisting more or less of back streets and yards; and if the Council used electricity for lighting the main streets, the bulk of their present gas consumption would be dispensed with. The Company did not object to an agreement to grant a discount varying with the consumption.

Mr. Baker pointed out that, if the Council lighted only one street lamp with electricity, they would lose their discount in respect of gas consumed, if the agreement were amended as proposed.

Mr. Ronca asked if the Council would object to a saving clause in the Order.

Mr. Baker said that, prior to the passing of the Gas Regulation Act, the Board of Trade had never altered an agreement which had been made between a statutory gas company and a local authority without the consent of both parties. If a gas company wished to alter its charges, it had to make application under section 1 of the Gas Regulation Act, and not under section 10; there was no power to alter charges in the latter section.

Mr. Ronca said the Board's powers under section 10 were rather wide; and under it they could do anything that could be done under the Gas and Water Works Facilities Act.

Mr. Baker maintained that the whole procedure had been altered by dividing the Gas Regulation Act into sections. It was an unheard-of thing, he said, to suggest that, in consequence of the introduction of electricity into a district, the price of gas was to be increased.

Mr. Ronca said that was one way of putting it, but the Company had put it in another way. They had made a bargain at a certain date, when the conditions appeared straightforward and clear. They might have made a bargain depending on the quantity of gas taken by the Council, but they saw no reason to think that it might be decreased seriously. Then, some years afterwards, conditions had changed, and they had thought that, because of other possibilities, the quantity taken might be seriously decreased. Their case was that conditions had altered, and the wording of the old agreement was unsuitable.

Mr. Baker maintained that the Board of Trade ought not to take into consideration any alteration in the charge for gas consequent upon the introduction of electricity. The rule of the Houses of Parliament was that gas companies had no *locus standi* against the introduction of electricity, nor electricity companies against the introduction of gas. If the Knottingley Gas Company were allowed to alter the agreement, the Corporation would lose a discount of £51 per annum straight away.

Mr. Ronca said the Council would not be prevented from using the illuminant they considered best. On the other hand, if the Council decided to light the streets by electricity in the greater part of the area, and to use gas in one outlying street, did they still contend that the discount on the gas bill should be 10 p.ct.?

Mr. Baker said they did.

Mr. *B. Arnold* (Manager and Secretary of the Company), replying to Mr. Ronca, said that the discount allowed to every consumer other than the Council, for prompt payment, was 2½ p.ct. Previously there was a further discount to large consumers, but the Company had reduced the price of gas for power purposes, and now gave the same discount to all consumers. The price of gas for power and heating, both for industrial and domestic purposes, was 1d. per therm less than for lighting. There were two meters for every consumer using gas for both purposes, and a rental was charged for each meter.

Mr. Ronca, commenting on the fact that the discount to all consumers (other than the Urban District Council) was the same, irrespective of consumption, said that seemed to be a point against the Company in regard to the present inquiry. In the course of further discussion, Mr. Ronca said that the Council had consumed 1,142,000 c.ft. in 1912, and 2,760,000 c.ft. in 1924. Therefore, it might be

argued that, if the Council replaced half the present number of gas lamps with electric lamps, they would still be using as much gas as when the agreement was made.

Mr. BENTLEY said the Company were prepared to allow the 10 p.ct. discount so long as the Council consumed the same amount of gas as in 1912.

Mr. BAKER asked whether it was really worth while upsetting a bargain which had been ratified by Parliament, and binding the Council to a scale which had not been agreed upon. The cost of the gas used in 1912 would not have been more than about £265, and 10 p.ct. on that was only £26. The Council would be entitled to a discount of 2½ p.ct. in any event, and they would be entitled also to some further discount, so that it was a small matter.

CONSOLIDATION OF CAPITAL.

Mr. BENTLEY, dealing with this question, said that the capital already issued amounted to £8800. Of this £5000 was in £5 shares, carrying a maximum dividend of 8 p.ct.; £1600 in £1 12s. shares, with a maximum dividend of 8 p.ct.; and £2200 in £1 shares, with a maximum dividend of 5 p.ct. It was proposed to consolidate the capital into £8800 in £1 shares, with a dividend of 7 p.ct. The Auditor's report stated that the £1 share was more likely to attract the investor than the £5 share, particularly in this part of Yorkshire, where there were a lot of people with small amounts to invest. To emphasize the curious position which exists at present, he said that some of the existing shares were sold by auction recently. The £5 shares were withdrawn at £6 10s., and subsequently sold at that figure; the £1 12s. shares were sold at £1 10s.; and the £1 shares at par. Thus the £5 shares were sold at a premium, and the £1 12s. shares at a discount, though they both carried the same dividend. Again, after consolidation, each shareholder would have the same voting power in respect of each £1 share, whereas at present only the holders of the £5 shares exercised their voting power. If, at present, the holders of the £1 12s. shares had no vote, they were in an unfair position, but, on the other hand, if they were entitled to a vote, that would be unfair to the holders of £5 shares, because there would be only one vote per share. It was hoped to put that right by consolidation. The capital position was serious. There was an overdraft from the bank, who had said they could not continue it; on the other hand, the Company realized that they could not continue without it. There had been considerable capital expenditure inside the works, and on new mains; and it was also necessary to erect a new gasholder. The actual output at present was approximately 120,000 c.ft. per day, and storage capacity was 56,000 c.ft., so that the position was impossible.

Mr. RONCA referred to the method of exchanging the old capital for the consolidated capital. The Order proposed that for every £10 of existing 8 p.ct. capital there should be given £11 of new capital, and for every £10 of existing 5 p.ct. capital, there should be given £7 of consolidated capital. He said that the Company had not adopted the usual method, whereby the adjustment was made so that the new capital would earn the same amount as the old.

Mr. *G. Thomas* (Auditor to the Company) replied that the standard method would not have been equitable to the shareholders in this case.

The inquiry then closed.

NEW FOOTBALL GROUND AT OVENDEN PARK.

Generosity of Mr. Wilfrid Drake.

The Halifax Rugby Union Club on Saturday, Nov. 28, played the opening game on a new, spacious, and elaborately equipped ground at Ovenden Park, which has been provided for them by the generosity of Councillor J. Wilfrid Drake (head of Messrs. Drakes Limited), who has declared his willingness to place yet another field at disposal for recreation purposes, should it be necessary. In what he has done, Councillor Drake has been actuated by a desire to provide good, healthy, amateur sport, in order to restore Halifax to its former position in the Rugby Union world.

[*Photo. Halifax Courier, Ltd.*

Opening of New Rugby Union Football Ground at Ovenden Park, Halifax, Nov. 28, 1925.

A group at the opening ceremony. Left to right: Mr. J. W. Bancroft, Mr. M. T. Thompson, Mr. J Wilfrid Drake, Master William Peter Bulmer, Mrs. J. W. Drake, Miss Joan Bulmer, Lady Bulmer, and Miss M. Drake.

Among those present at the opening ceremony were Sir William Bulmer (President) and Lady Bulmer, Councillor Wilfrid and Mrs. Drake, Mr. J. J. Glendinning, and Mr. J. Standeven. Introducing Mrs. Drake, Sir William Bulmer described the event as a memorable one, observing that all would rejoice with him that they were enabled to assemble on that magnificent ground, placed at the disposal of the Club through the generosity of Councillor Drake. Mrs. Drake then opened the Committee-room door of the pavilion, expressing her sincere pleasure in performing this duty. She hoped that the improved accommodation would greatly add to the comfort of the ladies and members, and that the new ground would be an incentive to play the game for the Halifax Club.

The President offered the thanks of the Club to Mrs. Drake; and Miss Joan Bulmer presented her with a beautiful bouquet. Mrs. Drake was also the recipient of some handsome Chinese *portières*, presented, on behalf of Lady Bulmer and the Club, by Mr. Harry Eastwood (Captain).

[*Photo. Halifax Courier, Ltd.*

Mrs. J. Wilfrid Drake, who performed the opening ceremony, and Sir William Bulmer (President, Halifax Rugby Union Football Club).

The opening of the new ground was commemorated by a dinner in the evening, when Sir William Bulmer made further reference to Councillor Drake's generosity. It must, he said, have been the clean, healthy, and vigorous way in which their team had played that had inspired Councillor Drake to place such a fine ground at their disposal. In response, Councillor Drake remarked that the President had been at the bottom of the whole business. Sir William had made the town famous for sport.

Chapel Whaley and District Gas Company.—In their annual report the Directors of the Company state that the total income for the past year was £18,320, and the revenue profit was £3235. There was allotted £450 to the special purposes fund, bringing the total of the fund to £1650. The Directors recommend a dividend of £4 10s. p.ct., making the dividend for the year £7 15s. The sum of £4213 was carried forward, as against £3949 last year.

Newcastle Gas Company's Works Clerical Staffs' Guild.—The members of the Guild, comprising the clerical staffs at the Redheugh Gas-Works, the Distribution Department at Market Street, and the Elswick Gas-Works and Bye-Product Works, held their third annual dinner at the Central Exchange Hotel, Grey Street, Newcastle, on Friday last. The President of the Guild (Mr. W. G. Robinson) was in the chair, and was supported by the Vice-President (Mr. B. Rust).

LOW-TEMPERATURE CARBONIZATION AND SENSIBLE HEAT DISTILLATION.

Evidence before the Royal Coal Commission.

The problems of low-temperature carbonization and sensible heat distillation, and their effect upon the coal industry, were dealt with by witnesses before the Royal Commission on the Coal Industry at its sitting on Thursday, Dec. 3. The witnesses were Lieut.-Col. N. G. Thwaites (on behalf of Low Temperature Carbonisation, Ltd.), and Mr. Harald Nielsen (on behalf of Sensible Heat Distillation, Ltd.).

LOW-TEMPERATURE CARBONIZATION.

Lieut.-Col. *Thwaites* made a brief reference to the development of smokeless fuel making from coal, and the extraction of oils, since experiments were begun, in 1900, by the late Thomas Parker, in association with F. W. Salisbury Jones. Dealing with the floating of the first Company formed for making smokeless fuel, in 1907—namely, Coalite, Ltd.—he said that in that year, on the eve of an appeal to the public, the Gas Light and Coke Company, being aware of the progress made by the infant industry, offered to the public a substance known as "Carbo," which was claimed to be smokeless and easily ignited. This action, he said, was deliberate on the part of the Gas Light and Coke Company, and had the effect desired by the Gas Company; and for many years the development of Coalite was hampered. Carbo, however, ceased to appeal to the public after about nine months, and had never been heard of since. Coalite smokeless fuel had continued to be in demand throughout the country, however, though the handicap from a financial point of view had remained until the present day.

Witness then dealt with the technical difficulties encountered in the extraction of oil and gas by the low-temperature process, and the developments leading up to the Parker retort as it exists to-day. Something like £1,250,000 had been expended on research work during the past twenty years, during which period over 300,000 tons of coal had been carbonized by the low-temperature process, including some 200 varieties of British coals from the leading mines of the country. Over 200,000 tons of Coalite and 5 million gallons of fuel oil had been produced and sold at higher prices than best domestic coal and the highest grade of petroleum imported from abroad. In addition, coals from every part of the world had been tested. The records obtained were of great national value, showing that practically all coals treated, with or without blending, were applicable to this process, and yielded, on an average, results similar to those obtained by the Fuel Research Board's experts when they made an examination of the low-temperature plant at Barnsley last year—namely, 18 gallons of oil, about 3 gallons of Coalite motor spirit, 5000 c ft. of 600 B.Th.U. gas, and 14 cwt. of Coalite smokeless fuel from each average ton of coal carbonized. The opposition of vested interests, and particularly the gas companies and collieries, was, however, a very serious handicap in the raising of money for further development on a large scale. This attitude, however, was changing rapidly, it being recognized by colliery owners and managers of gas concerns that low-temperature carbonization offered a solution of many of their difficulties. Contracts entered into with an important firm of coal distributors, who had already sold Coalite to many thousands of customers, indicated that the demand for smokeless fuel was practically without limit. The oils had been sold at prices higher than those ruling for petroleum products. A report by the Air Ministry testified to the high quality of the aviation spirit, and tests made by Colonel the Master of Sempill (the aviator) showed that Coalite motor spirit and aviation spirit had an efficiency 12 p.ct. greater than the highest grade of motor spirit from petroleum.

Referring to the balance-sheets presented to the Commission on Nov. 4, by Mr. Milne Watson, which purported to show profit and loss for the Coalite process as compared with gas-works practice, witness put forward a corrected balance-sheet prepared by the Accountants of Low Temperature Carbonisation, Ltd., showing that, instead of a loss of 0·55d. for Coalite, there was a profit of 26·86s. per ton, as compared with high-temperature gas-works practice of 14·81s. [This was given in the "JOURNAL" for Nov. 25, p. 526; and Mr. Milne Watson's reply is on p. 594 of the issue for Dec. 2.] An estimated balance-sheet for a plant of 1000 tons daily capacity, showing an annual profit of £71,000, was submitted by the witness.

Mining for large coal would, in course of time, become less necessary, and miners would be paid for the production of small slack coal at a higher rate than that now prevailing. It was estimated that 25 p.ct. of all coal mined was small coal, which meant that some 60 million tons were available annually, and this was the material needed for low-temperature carbonization. At present it had small marketable value, much of it not even being raised to the surface. Small coal worth 2s. 6d. at present could be converted into commodities worth 30s., while at the same time one of the great dangers in mines—*i.e.*, that of explosion due to finely-divided coal, would be removed. Hundreds of mines now run at a loss, or actually closed down, could be turned into revenue-producing enterprises. As to oil, the 60 million tons of small coal could be made to furnish half the motor spirit required by the country and more than all the crude petroleum imported, which products now cost this country over £40,000,000 annually. In its powdered form, Coalite was superior to pulverized coal for industrial purposes, and was not liable to explosion.

Plants of 1000 tons per day capacity would have as output:

Gas	1260 million c.ft. of 500 B.Th.U.
Coalite smokeless fuel .	235,000 tons.
Fuel oil and lubricating oil	6,300,000 gallons.
Motor spirit	900,000 gallons.
Sulphate of ammonia .	2280 tons.

Replying to the CHAIRMAN (Sir Herbert Samuel), witness said that the Company's difficulties had been entirely financial, and technical difficulties had been overcome.

Witness suggested that it would pay the Government to offer a substantial bonus—even to the extent of a quarter of a million—to any person or firm coming forward with a process which would satisfy conditions to be laid down, and by which a practicable production of crude oil of a consistent specification could be assured at a commercial price.

SENSIBLE HEAT DISTILLATION.

Mr. *Harald Nielsen* (Sensible Heat Distillation, Ltd.), in his evidence, referred to the "L and N" process of distillation of coal by sensible heat, which he had evolved in 1918. A retort was then built, and it provided valuable technical, scientific, and engineering information, which enabled the present plant of the Company, at Barnsley, to be designed. [An account of the working of this plant is given in this week's "JOURNAL," p. 654]. A request to the Fuel Research Board for assistance in the development of the process [see p. 673], in November, 1921, was declined.

From the information the Company had gathered, it was clear that the two essentials of successful distillation were low capital cost of plant, and low working expenses. The Company considered that the capital cost of a complete plant, including buildings, should not exceed £20,000 for a unit capable of distilling 35,000 tons of coal per annum, and that the working expenses, including depreciation, maintenance, labour, fuel, power, steam, stores, &c., should not exceed 4s. 6d. per ton of material distilled. The Company's main object had always been the making of small coals of more value for industrial purposes by distillation, at the same time keeping the question of domestic smokeless fuel in view. They were of the opinion that, if coal were fed into a retort at 10s. per ton, then as an economic question the resultant fuel should be sold at 10s. As a matter of fact, they were obtaining up to 30s. per ton for household smokeless fuel at the works, produced from slack at 8s. per ton. During the years 1922-23 results of research were tabulated and working drawings prepared for plants capable of distilling up to 100 tons per day. In a small demonstration plant for testing all types of carbonaceous materials, the Company had successfully treated shale, cannel, coking coal, caking coal, non-caking coal, lignite, brown coal, and sewage. With regard to the life of these plants, the Company were satisfied that 15 years was a reasonable time. In support of this, he referred to the experience with cement kilns, which were somewhat similar, and which worked at much higher temperatures. After the Company had completed their tests, several colliery companies were in negotiation with them for plant; but in view of the statement made by the Minister of Mines, in the House of Commons—that "the one ray of hope in the coal trade was carbonization, and that neither money nor energy would be spared in making this a commercial success"—the colliery companies wrote to the Minister of Mines asking what financial assistance the country was prepared to give. They were still prepared to go ahead on receiving a satisfactory answer.

The Company had carried out scientific work on the oils produced under their system, and had found that they were entirely different from those produced by any low-temperature plant within their knowledge, and of a much higher quality, and, consequently, of greater value. As much as 5 gallons of lubricating oil could be produced per ton of coal. Some of the oil had been sent to be tested in comparison with one of the best lubricating oils on the market; and the test, made by the National Physical Laboratory, was in the Company's favour.

With reference to the small residue, they were at present erecting a powdered fuel producer for the consumption of this material, which, unlike the breeze produced by high-temperature or other low-temperature processes, was easily ground and was of a highly reactive nature. The Company believed that this powdered fuel producer would materially assist the steel trade in lowering their cost of production. They were also satisfied that the small coal, which was of little use to-day, could be powdered after distillation, and used for all purposes. It could be stored safely, as the dangerous constituents were removed by distillation, and it should prove a great competitor of fuel oil. The plant at Barnsley could be run as a commercial enterprise, but the main object of building it was for demonstration purposes.

In order to refute a statement made by Mr. Milne Watson, in his evidence before the Coal Commission, that Sensible Heat Distillation, Ltd., had obtained their process from the Bamag-Meguin Company, Mr. Nielsen put forward extracts from the report of the Managing Director of a well-known Continental firm, who had compared the Fellner and Ziegler, Thyssen, Stinnes (M.A.N.), Meguin, Carbocoal, Coalite, A.V.G., Lurgi, Maclaurin, and Nielsen ("L. & N.") retorting systems. The report stated that: (1) The semi-coke produced by the "L. & N." process was at least as good as by any other revolving system; (2) the chief distillation conditions for the production of oil were more closely approached by the "L. & N." process; and (3) the construction was much more simple than by the Stinnes and Meguin systems, and upkeep less, and in all circumstances the Bamag-Meguin Company should secure the building rights.

Dealing with the costs for heat-treating small inferior coal by this process, Mr. Nielsen said that, on the basis of distilling 35,000 tons per annum in one unit, capital cost should not exceed £20,000, and the total working costs per ton of coal treated, including depreciation and repairs (12½ p.ct. on the cost of plant), labour, fuel requirements, steam and power, and cost of handling and delivering into trucks, should be 4'506s.

With regard to solid fuel, Mr. Nielsen divided it into (*a*) the treatment of a bituminous caking coal for lump coke production for industrial or domestic use; and (*b*) the treatment of bituminous caking or non-caking coals for the production of a small residue suitable for direct firing under boilers, either by means of chain grate stokers or as powdered fuel.

It was possible to effect an up-grading of the material, particularly from the younger genii of coals, by reducing the oxygen content, and thus obtaining a fuel of a higher calorific value, weight for weight, than the original raw coal. Secondly, the Company had observed that, during treatment in their retort, particularly in the case of non-coking smalls, a classification took place, owing to the swelling and increase in volume of the coal substance in relation to the slaty substances. The considerable difference thereby obtained between the specific gravities rendered cheap wind separation possible on properly-

sized material, so that without wet washing a purer coke could be obtained than would otherwise be the case from the original raw coal, and therefore a material could be produced of an all-round higher value. This fuel was eminently suitable for the open domestic fire in all respects, and was unequalled for producer gas manufacture. With regard to the oil produced by the "L & N" process, this resembled natural well oil more closely than did other artificially-produced oils. This was due entirely to the possibility of obtaining the oils without subjecting them to cracking or secondary thermal decomposition. Hence valuable heavy oil fractions (lubricating bases), which were unobtainable before, could be obtained in paying quantities. The production of oils of such a nature rendered the change-over from well oil to home-produced oil much more simple.

Three main grades of gas could be produced by the "L & N" process. These were:

(*a*) A straight producer gas, enriched by the distillation gases to a calorific value of from 200 to 230 B.Th.U. per c.ft., for use in furnace work, steel manufacture, and for general industrial purposes.

(*b*) A carburetted water gas, of a calorific value of 360 to 380 B.Th.U. per c.ft., suitable for town gas purposes as a diluent, or for industrial and manufacturing purposes.

(*c*) A distillation gas of a calorific value of from 650 to 750 B.Th.U. per c.ft., suitable for enriching town gas, or for long-distance transmission, or in a compressed state for welding and cutting, instead of acetylene.

The following table was given, showing the estimated profits derived from the distillation of various coals.

Conclusions Arrived at after Testing a Minimum Sample of 20 Tons from Each Kind of Coal.

EXPENDITURE.

—	Barnsley Bed.	Garforth Slack.	South Wales.	Dunfermline Scotland.	Yorkshire Cannel.
	s. d.	s. d.	s. d.	s. d.	s. d.
Cost of raw coal per ton . .	10 0	8 0	10 6	12 0	9 0
Labour, power, depreciation, maintenance, fuel . . .	4 6	4 6	4 6	4 6	4 0
Total expenses . .	14 6	12 6	15 0	16 6	13 0

REVENUE.

Oil (gallons)	17·5	18·8	19 0	21·5	36·0
Value at 4d.	5s. 10d.	6s. 3d.	6s. 4d.	7s. 2d.	12s. 0d.
Gas (therms).	22·70	13 00	17·40	11·85	17·10
Value at 2d.	3s. 9d.	2s. 2d.	2s. 11d.	1s. 11d.	2s. 10d.
Semi-coke, value ranging between 5s. to 18s. per ton .	11s. 4d.	6s. 6d.	12s. 6d.	11s. 6d.	3s. 6d.
Total revenue . . .	20s. 11d.	14s. 11d.	21s. 9d.	20s. 7d.	18s. 4d.
Profit per ton . . .	6s. 5d.	2s. 5d.	6s. 9d.	4s. 1d.	5s. 4d.

Replying to the CHAIRMAN, witness said that the Company had received definite orders from colliery companies for two 100-ton units; and another unit of similar size was being fixed up in India.

The CHAIRMAN asked whether Mr. Nielsen blamed the Fuel Research Board for not having laid down a plant, in 1921, to deal with a patented process.

Witness said the undertaking was so big that it was felt that a small private company could not undertake to see it through. They were willing to forego the royalties.

Mr. KENNETH LEE asked what capital expenditure would have been necessary if the Fuel Research Board had helped.

Witness replied that the cost of the plant was in all probability £25,000 in 1921.

Mr. KENNETH LEE asked if it were suggested that a group of colliery owners and others who were shareholders in the Company were not able to see the matter through with such a small capital expenditure.

Witness replied that they were seeing it through, but had had to do the work themselves.

Replying to further questions, he said there was no 100-ton unit yet in operation. The small demonstration plant had been running practically continuously since May, and he saw no difficulty in working the process on a commercial scale.

Mr. LEE said he gathered that the Company were not attempting so much to solve the household fuel problem as to produce fuel for boiler purposes.

Mr. *Nielsen* agreed, and said the Company recognized that industry had first claim. They could produce domestic fuel, however.

REQUEST TO FUEL RESEARCH BOARD 1921.

The following is the letter sent in 1921 to the Fuel Research Board, as referred to by Mr. Nielsen in his evidence.

SIR,—We beg to request your considerate attention to a proposal we desire to place before you which we think will influence materially the future development of trade and industry in this country by an entire revision of the methods of low-temperature carbonization.

We understand from the various reports of the work of the Fuel Research Board that it is within the province of the Board to investigate fully all the practical problems in connection with the possible elimination of the direct use of the raw material of coal as a fuel, and to substitute various forms of residual fuel to be obtained therefrom by carbonization and gasification processes—the aim generally being to meet the demand for:

(1) Home supplies of fuel oil for the navy.
(2) Motor spirit for transport and air service.
(3) A cheaper and more ample supply of electrical energy.
(4) The production of a smokeless domestic fuel, &c.

We recognize that these problems can only adequately be solved by the most scientifically organized experiment undertaken by such a body as the Fuel Research Board, on a working scale and under conditions approximating most closely to those prevailing in normal trade practice; and the reason we place our proposals before you is because we are strongly of the opinion that we are in possession of a most economical and efficient apparatus, which is without question the one most practical and efficiently designed for the carbonization of coal at low temperature in this or any other country, and it is because we believe that the evolution of such an economical and highly efficient apparatus is the main consideration at the moment that we put the following proposal before you:

We desire if possible that the Fuel Research Board should erect the apparatus—of which patent rights we are the sole owners—and test it on a full commercial scale at the Government Fuel Research Station, Greenwich. We believe that a fully detailed scientific test of this apparatus will give invaluable data towards solving the question of the possibility of undertaking low-temperature carbonization with large scale plants all over this country; and the points we think more particularly should be investigated are the following:

(*a*) The primary efficiency of the apparatus and the possibility of still further improving its general design to further such efficiency.

(*b*) The economic equation of the processes:

(1) As to the production of volatiles (spirits and lighter oils).
(2) " " " heavy oils.
(3) " " " sulphate.
(4) " " " smokeless fuel.
(5) " " " gas.

In regard to (1) to (4), it is thought that an inquiry undertaken by the Fuel Research Board would aim to ascertain in exact particular the quantitative and qualitative results of the system we propose to place before you.

(*c*) To relate all the tests of the plant to the use in the retort of:

(1) Coals.
(2) Lignites.
(3) Shales, and
(4) Slacks generally.

(*d*) To investigate not only the economic equation, but as to whether complete gasification can be attained (this latter being particularly important in view of the possibilities of the process in relation to town gas requirements).

(*e*) It is further thought an inquiry undertaken by your Board should deal adequately with the possibilities of producing commercial briquettes by a pressure system, working upon the hot residue fuel without any agglutinant.

(*f*) That the inquiry should be extended to the possible utilization of the residue fuel obtained from the apparatus, either as a powdered fuel for commercial purposes, for use in gas producers, for use under steam boilers, for use in steel furnaces, and for use in the gas producers of commercial vehicles.

(*g*) To extend the investigation particularly to cover the possible utilization of the residual fuel for the production of gas to feed into gas engines for the production of bulk electrical power and for commercial use by distribution through piped supply to industrial areas.

(*h*) To direct the whole series of experimental tests to give an exact equation in strict relation to unit costs of known coals, &c.

It is understood that your Board, through one of its various offices, has already made inquiry of the apparatus which we put before you and which was erected by us at Chatterley on the basis of a 10-ton plant. Dr. Lander has inspected this plant on behalf of the Fuel Research Board, and is in a position to give his report in regard to it.

We enclose for the information of your Board various published reports and documents detailing the system in the Technical Press and in our own reviews, from which it will be seen that the plant which we desire should be tested at the Fuel Research Station departs in main principles from all the old lines of low-temperature carbonization, mainly by the adoption of a slowly revolving retort, and internal heating with a gas free from oxygen—the rotary retort, together with the internal heating, aiming to secure the highest efficiency.

We should be in a position to afford you every information we have to date as to the thermal efficiency of the plant, with the facts at our disposal with regard to the heat required to carbonize the coal used in the retort.

The retorts may be constructed to deal with any quantity of coal per day, up to (say) approximately 100 tons; and we should perhaps inform you that a 100-ton plant is in process of erection in India at this moment.

We have information which leads us to believe that the cost of treatment per ton of coal is low, particularly when the low capital cost of the installation of the plant is taken into account, and the very economical character of its running charges.

We therefore desire the Fuel Research Board to consider the possibility of laying down a complete plant on a commercial scale at their Research Station fully to investigate all the matters at issue on this question, the principle of which we have sought to put before you in this letter.

I am to ask whether an early appointment could be granted to us to discuss the matter in greater detail and to urge that in the interests of the country generally, vitally concerned as it is with the solution of low-temperature carbonization, our proposals should receive your most immediate and sympathetic consideration.

Yours faithfully,
(Sgd.) BRYAN LAING.

To: *The Director,*
Fuel Research Board,
16-19, *Old Queen Street, S.W.* 1.
Nov. 25, 1921.

Combined Gas and Electricity Supplies.—A special meeting of the Wellington (Salop) Urban District Council was held last week to consider an announcement by the local Gas Company with reference to the Company making application for an Order to enable them to supply and distribute electricity in the urban district and surrounding areas. It was agreed "That the Council should enter opposition to the application of the Company."

Smoke Abatement League.—The sixth report of the Smoke Abatement League of Great Britain states that the accounts up to Oct. 30 showed a balance in hand of £16 13s. 2d. It records the carrying out of much useful work. A decision has been arrived at to issue a monthly bulletin entitled "Pure Air and Sunlight;" but unfortunately actual publication has been retarded through lack of funds. The Executive feel that there is a great need for something of this nature which will keep members and the general public acquainted not only with the work of the League, but also with many matters of great interest to the smoke abatement cause. The report is signed, on behalf of the Committee, by Mr. W. Melland (Hon. Treasurer and Acting Chairman) and Mr. C. Elliott (Hon. Secretary).

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market during the past week has been without special feature. Better arrivals of tonnage towards the end of the week helped the tone, which was firm in all sections. Shipping difficulties due to the weather conditions had still been affecting the position, and causing odd cargoes to be thrown on the market from time to time, especially in the case of Northumberland steams. But these were considerably firmer in tone at the close.

The demand in all Durham sections remains good. Coking coals are getting 15s. to 15s. 6d., and bunkers are well sold, with best brands quoting 16s. 6d. to 17s. f.o.b.

Wear Special gas makers quote 16s. 6d. to 17s., and best qualities ask 16s. 6d. Seconds are 15s. to 15s. 6d.

The coke market remains strong, and a feature has been a number of inquiries from America, especially for foundry makes, due to labour troubles and a shortage of anthracite coal there. Business is small as yet, but the inquiry is encouraging. Stocks here are low, and gas coke is in active demand at 24s. to 25s. f.o.b.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Collieries in Yorkshire and Lancashire report maximum working hours during the past week owing to a more normal state of the house coal trade. The stocks which had accumulated a month ago have now disappeared.

There appears to be a better tone among the industrial consumers, and the prices of some of the better qualities have slightly advanced, other descriptions being firm.

Gas coals move freely under contract, with indications that a few of the large works are rather under-bought.

The export market is chiefly concerned with South Yorkshire washed doubles; but this is not an indication of increased business from abroad; the situation having arisen through forward sales on this side. Other qualities are normal.

The following are the Humber bunker and export prices (f.ob. usual shipping ports): South Yorkshire.—Hards, Association, 18s. 6d. to 18s. 10½d.; screened gas coal, 18s. to 19s.; washed doubles, 21s. to 21s. 6d.; washed singles, 17s. 9d. to 18s.; washed smalls, 13s. 6d. to 14s. 6d.; rough slack, 9s. 6d. to 10s. 6d.; smithy peas, 19s. 6d. to 20s. 6d. West Yorkshire.—Hartleys (f.o.b. Goole), 17s. to 18s.; washed doubles, 17s. 6d. to 18s.; washed singles, 17s. to 17s. 6d.; washed smalls, 13s. 6d.; coking smalls, 9s. 6d. to 10s. 6d. Derbyshire and Nottinghamshire.—Top hards, 19s. to 20s.; washed doubles, 18s. to 18s. 6d.; washed smalls, 12s. 9d. to 13s. 6d.; rough slack, 9s. 6d. to 10s. 6d. Yorkshire, Derbyshire, and Nottinghamshire.—Screened steam coal, 16s. to 18s.; gas coke, 24s. to 26s. 6d.; furnace coke, 19s. to 20s. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

There is an all-round quickening of demand. It is less apparent in regard to industrial fuel than in household qualities; but the slight expansion in the call for steam grades has been emphasized by absorption of over-supplies in other directions. D.S. nuts have hardened to some extent. The position of beans has become more stable. There is no longer the superabundance of slacks that congested the market a few weeks ago. Concessions on list prices have been generally withdrawn, and collieries which did not make their customary autumn advances on household coal have now come into line with the rest. Actual selling rates at the pit head have been irregularly increased by 1s. to 2s. Where there were special disparities the difference amounts to 2s. 6d. There has been a corresponding tightening up of retail prices, though it is only here and there that industrial grades are affected. Stocks have been materially reduced, and collieries are now complaining that inadequate transport facilities are curtailing output below consumptive requirements in many departments.

A strong protest has been made by Birmingham merchants respecting the traffic arrangements on the L.M. & S. system. It is alleged that the forwarding of trains is so irregular that periodical deliveries against contracts cannot be maintained, and further, that wharfage facilities are very inferior as compared with those formerly afforded. The General Manager of the railway has promised personal attention to the matter.

Successful Issue of Preference Stock at Bedford.—The tenders sent in for the £25,000 of 6 p.ct. preference stock in the Bedford District Gas Company, which Messrs. A. & W. Richards offered on behalf of the Directors, amounted to £43,935, and ranged from £105 p.ct. down to the minimum of par. The average price of allotment was £101 1s. 1d. p.ct.

Canadian Gas Inspection Service.—The report for the year to March last of Mr. J. L. Stiver (Acting Director of Electricity and Gas Inspection Services of the Canadian Department of Trade and Commerce) furnishes particulars of the companies registered and of the tests undertaken of gas and meters. The number of meters in use by each undertaking is stated. The total number of gas meters tested during the year was 105,399; while the total number of meters in use for manufactured gas was 405,471, for natural gas 106,861, and for acetylene 404. There were 3209 tests made on manufactured gas to determine its calorific value. Of these tests, 23 showed the gas to be below the standard quality required by the regulations, which state that the calorific value of the gas shall at all times be at least 450 B.Th.U.

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See "Gas Journal" Dec. 2, 1925, Page 592.

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STOCK MARKET REPORT.

A CERTAIN amount of relief was felt when the announcement of the increase in the Bank Rate was made. There was no illusion as to the necessity for the change, though up to comparatively a few hours of the announcement the Money Market was still hoping that at least another week would pass without an increase. The effect on the Stock Exchange was practically *nil*. British Government securities, Colonial Loans, and first-class debentures were in demand, and the markets closed firm. Even the signing of the Pact produced no sensational movements, possibly because its influence was anticipated; and, apart from the fluctuations of the franc, the Foreign Market was unusually steady. Notwithstanding the poor traffic returns, the Home Railway stocks turned round, prices showing welcome recoveries.

Industrials were unexciting; the one bright spot being Carreras following their enormous profit announcement. Circumstances are still favourable for Rubber; and with the price of the commodity at 4s. 7d. per lb. firm, it cannot be said that the high-water mark has been reached in the matter of share prices.

Gas Stocks and Shares were not in the ascendant; but after the improvements of the past four or five weeks, it is perhaps not surprising that there should be a slight reaction. The stocks of two important companies—the Gas Light and Coke and the Brentford—eased off; and it is possible that a reason may be found in the renewal of the demand of the Union of General Workers for a large increase in wages. Whether or not this is the cause for the reductions of the past week, it is bound to have an effect on stock values.

The following transactions were recorded during the week:

On Monday, Brentford "B" 102, British 106¼, 106⅜, Gas Light and Coke 86¾, 87, 87¼, 87⅜, 87½, 4 p.ct. preference 79, 80, 3 p.ct. debenture 60 7/16, Imperial Continental 138½, *ex* div., 3½ p.ct. debenture 71⅜, Primitiva 12s. 3d., 12s. 4¼d., 12s. 7¼d., South Metropolitan 94, 94¼, 3 p.ct. debenture 59, 6½ p.ct. debenture 104½, South Suburban 5 p.ct. 90½, Uxbridge Maidenhead and Wycombe 5 p.ct. 94½, 95.

On Tuesday, Bournemouth "B" 12½, Commercial 4 p.ct. 81½, Croydon maximum dividend 83, European 6½, Gas Light and Coke 86¾, 87, 87½, 4 p.ct. preference 79, 3 p.ct. debenture 60, Hastings and St. Leonards 5 p.ct. 92⅜, 3½ p.ct. 74, Imperial Continental 136, 137, 138 *ex* div., Primitiva 12s. 3d., 12s. 6d., South Metropolitan 94, 95, 6½ p.ct. debenture 103⅜, South Suburban 5 p.ct. 100, Tottenham "B" 91, Uxbridge Maidenhead and Wycombe 5 p.ct. 94½. Supplementary prices, Croydon 7 p.ct. debenture 105, Lea Bridge 7½ p.ct. debenture 104, Liverpool 5 p.ct. 82⅛, 83¾.

On Wednesday, Commercial 3 p.ct. debenture 57¾, Gas Light and Coke 86½, 86⅝, 87, 87¼, 4 p.ct. preference 80, 3 p.ct. debenture 60½, Hastings and St. Leonards 3½ p.ct. 68, Primitiva 12s. 6d., Sheffield "A" 99¾, "B" 99⅜, South Metropolitan 94, Tottenham "A" 114. Supplementary prices, Croydon 7 p.ct. debenture 105½, Newport (Mon.) 5 p.ct. debenture 86¼, Romford 7 p.ct. "B" shares 9, 9 1/16, Southend-on-Sea 4 p.ct. debenture 73½, 74.

On Thursday, Bournemouth 4 p.ct. debenture 79, Brentford "A" 102, Gas Light and Coke 86, 86⅛, 3 p.ct. debenture 60⅜, Imperial Continental 135½, 136, 137½, Primitiva 11s. 10½d., 12s. 3d., 4 p.ct. (Buenos Ayres) debenture 66½, 67, South Metropolitan 94½, South Suburban 5 p.ct. 99½. Supplementary prices, Hastings and St. Leonards 3½ p.ct. debenture 68, 68½.

On Friday, Commercial 4 p.ct. 81, 81⅜, Gas Light and Coke 85⅝, 86¾, Hastings and St. Leonards 5 p.ct. 91½, 3½ p.ct. 73, Primitiva 11s. 9d., 12s., 12s. 1½d., South Metropolitan 94, 94⅛, 94½, Tottenham "B" 91½, 91⅜. Supplementary prices, Danish ordinary 5½, Wandsworth 5 p.ct. preference 90.

The increase in the Bank Rate put an immediate stop to the drain of gold from this country. The Money Market relieved of the uncertainty applied for a much larger amount of Treasury Bills, and over £44,000,000 were placed at an average of £4 10s. 6·05d. p.ct., as compared with £3 19s. 0·91d. p.ct. the previous week. Money was abundant, and fresh accommodation was again offered down to 2½ p.ct.

At the close of last week the New York Exchange was strong, the quotation rising to 4.85½, the final rate being 4.85 5/32. ¶ In the case of the French exchange the franc displayed a firmer tendency, and the fluctuations were within a comparatively narrow range. The rate closed at 125⅞. Belgian francs declined 1½ centimes to 107.92½, and Italian lire were a trifle dearer at 120½.

The Silver Market was again firm in tone, China being reported a buyer. The price was 32 3/16d. per oz. Gold was 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3½ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Dec. 4.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 13	5	5	Aldershot 5 p.c. max. C.	75—78	..	..
295,492	"	"	4	4	Do. 4 p.c. Pref.	70—75	..	..
1,551,868	"	Oct. 8	6½	6½	Alliance & Dublin Ord.	68—72	..	..
374,000	"	July 9	4	4	Do. 4 p.c. Deb.	60—65	..	..
300,000	1	Oct. 22	1/7⅛	1/7⅛	Bombay, Ltd.	¾—1	..	..
170,000	10	Aug. 13	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	"	7	7	Do. B 7 p.c.	11—12	..	..
150,000	10	"	6	6	Do. Pref. 6 p.c.	56—59	..	..
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb.	77—80	..	79
162,025	"	"	4	4	Do. 4 p.c. Deb.	98—103	−2	102
992,045	"	July 9	6 1/16	6 1/16	Brentford A Con.	98—103	−2	102
990,500	"	"	6½	6½	Do. B New	95—98	..	..
76,000	"	"	5	5	Do. 5 p.c. Pref.	76—81	..	..
306,690	"	June 11	4	4	Do. 4 p.c. Deb.	100—105	..	..
181,337	"	"	6	6	Do. 6 p.c. Rich Red. Deb.	170—175	..	..
214,740	"	Aug. 27	12½	12	Brighton & Hove Orig.	137—142	+2	..
244,200	"	"	9½	9	Do. A Ord.	89—91*a*	..	..
1,287,500	"	July 23	5	5	Bristol 5 p.c. max.	105—110	..	106½—106½
855,000	"	Oct. 8	7	8	British Ord.	120—125	..	..
100,000	"	June 25	7	7	Do. 7 p.c. Pref.	71—76	..	..
180,000	"	"	4	4	Do. 4 p.c. Red. Deb.	6¾—7¼	+¼	..
100,000	10	May 21	6	8	Cape Town, Ltd.	6½—6¾	..	..
100,000	10	Nov. 5	4½	4½	Do. 4½ p.c. Pref.	70—75	..	..
130,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb.	98—101	..	..
626,860	"	July 23	6	6	Cardiff Con. Ord.	101—104	..	..
237,860	"	June 25	7½	7½	Do. 7½ p.c. Red. Deb.	90—95*b*	..	..
137,150	"	Aug. 15	6¾	5	Chester 5 p.c. Ord.	81—86	..	81—81½
1,515,280	"	July 23	5/12/8	5⅝	Commercial 4 p.c. Cap.	81—86	..	..
560,000	"	"	5⅝	5/3/4	Do. 3½ p.c. Cap.	56—59	..	57½
475,000	"	June 11	3	3	Do. 3 p.c. Deb.	35—40	−1	..
800,000	"	Oct. 8	—	4	Continental Union, Ltd.	87—90	..	..
200,000	"	"	7	7	Do. 7 p.c. Pref.	97—101	..	..
660,000	"	Aug. 13	6½	6½	Croydon sliding scale	81—84	..	83
284,975	"	"	5	5	Do. max. div.	107—109*c*	..	..
492,270	"	Aug. 13	9	6	Derby Con.	74—76*c*	..	..
55,000	"	June 25	4	4	Do. Deb.	6½—7½	..	6½
1,002,180	10	July 23	4	6	European, Ltd.	85—87	−1	85½—87½
16,460,070	Stk.	Aug. 13	5½	5½	Gas Light & Coke 4 p.c. Ord.	60—63	..	..
2,800,000	"	"	5½	5½	Do. 3½ p.c. max.	77—80	..	79—80
4,068,235	"	"	4	4	Do. 4 p.c. Con. Pref.	60—63	..	60—60 7/16
4,761,930	"	June 11	3	3	Do. 3 p.c. Con. Deb.	..	..	..
130,000	"	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	"	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	"	Sept. 10	6½	6½	Hastings & St. L. 5 p.c. Conv.	90—95	..	91½—92½
258,742	"	"	5½	5½	Do. 3½ p.c. Conv.	71—76	..	68—74
70,000	10	Sept. 24	10	10	Hongkong & China, Ltd.	19½—20½	..	..
86,600	Stk.	Aug. 13	10	10	Hornsey 7 p.c.	132—137	..	..
1,976,000	"	Nov. 19	59	10	Imperial Continental Cap.	135—140	−2	135½—138½
226,170	"	Aug. 13	3½	3½	Do. 3½ p.c. Red. Deb.	70—71	..	71½
235,242	"	Aug. 13	6½	6½	Lea Bridge 5 p.c. Ord.	97—102	..	..
1,127,340	"	Aug. 13	5½	5½	Liverpool 3 p.c. Ord.	83—84*b*	..	84—85½
600,000	"	Sept. 24	7	7	Do. 7 p.c. Red. Pref.	101½—103½*b*	..	—
165,736	"	Aug. 27	8	9	Maidstone 5 p.c. Cap.	118—128	..	..
63,480	"	June 25	3	3	Do. 3 p.c. Deb.	55—60	..	..
75,000	5	Dec. 3	7	6	Malta & Mediterranean	3¼—4¼*	−¼	..
341,920	Stk.	Nov. 19	4	4	Montevideo, Ltd.	66—70	..	..
2,081,315	"	Aug. 13	5	5	Newcastle & Gateshead Con.	71—71¼*d*	..	..
300,929	"	"	4	4	Do. 4 p.c. Pref.	75¼—76¼*d*	..	..
529,705	"	June 25	3½	3½	Do. 3½ p.c. Deb.	68—69*d*	..	..
15,000	"	Aug. 27	12	11½	North Middlesex 10 p.c.	160—170	..	..
75,940	"	"	8⅞	8 7/16	Do. 7 p.c.	115—120	..	..
300,000	Stk.	Dec. 3	7	9	Oriental, Ltd.	98—103*	−4	..
188,120	"	June 25	7¼	7¼	Plym'th & Ston'house 5 p.c.	112—117	..	..
60,000	50	Aug. 27	14	14	Portsea Island B	93—96	..	..
100,000	50	"	13	13	Do. C	90—95	..	..
2,289,909	1	—	—	—	Primitiva Ord.	11/6—12/6	−/9	11/9—12/7½
302,600	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	82—84*	−2	..
600,000	Stk.	July 23	4	4	Do. 4 p.c. Red. Deb. 1911	64—66	..	..
193,744	"	June 25	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	..	66½—67
264,496	"	"	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	..	..
150,000	10	Sept. 24	6	6	San Paulo 6 p.c. Pref.	7¼—8	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—45	..	..
870,000	Stk.	Aug. 27	5½	5½	Sheffield A	99—101*s*	..	99½
419,968	"	"	5½	5½	Do. B	99—100*s*	..	99⅜
1,047,000	"	"	5½	5½	Do. C	99—100*s*	..	..
90,000	10	June 11	6	4	South African	5—7	−1	..
4,609,895	Stk.	Aug. 13	6½	5	South Met. Ord.	93—95	..	94—95
1,895,445	"	July 9	3	3	Do. 3 p.c. Deb.	57—60	..	59
734,000	"	Sept. 10	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	103½—104½
91,500	"	Aug. 13	8½	8½	South Shields Con.	130—132*d*	..	..
1,127,795	"	July 23	6½	6½	South Suburban Ord. 5 p.c.	99—103	..	99½—100
368,837	"	June 25	5	5	Do. 5 p.c. Deb.	95—98	..	—
647,740	"	Oct. 22	5	5	South'mpt'n Ord. 5 p.c. max.	78—81	..	..
121,275	"	June 25	4	4	Do. 4 p.c. Deb.	70—75	..	..
250,000	"	Aug. 27	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	"	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	101—103	..	..
130,000	"	July 23	8	7½	Tottenham District A 5 p.c.	110—115	..	114
888,275	"	"	6½	5½	Do. B 3½ p.c.	88—93	..	91—91½
150,000	"	July 9	—	28/4	Do. 5½ p.c. Pref.	103—105	..	..
181,255	"	June 11	4	4	Do. 4 p.c. Deb.	76—79	..	..
258,251	"	Aug. 27	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, &	70—72*d*	..	..
197,294	"	Aug. 27	6½	6½	Wycombe 5 p.c.	93—98	..	94½—95
88,330	"	"	5	5	Do. 5 p.c. pref.	93—98	..	..
91,800	"	"	6½	6½	Do. 5 p.c. Maidenh'd	88—93	..	..
30,000	"	July 9	9½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	128—133	..	..
855,636	"	"	7½	7	Do. B 5½ p.c.	109—114	..	..
392,955	"	"	6/9/6	5/19/0	Do. C and New	92—97	..	..
358,000	"	"	7⅜	6½	Wimbledon 5 p.c.	103—108	..	..
98,000	"	"	7½	7½	Epsom 5 p.c.	113—118	..	..
88,416	"	June 25	5	5	5 p.c. Deb.	56—59	..	..

Quotations at:—*a*,—Bristol, *b*,—Liverpool, *c*,—Nottingham, *d*,—Newcastle, *s*,—Sheffield. *Ex. div.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, Dec. 7.

The market for pitch continues firm, and the price is steady at about 50s. per ton f.o.b.

Creosote is unchanged at 7⅛d. to 7¼d. per gallon net and naked at makers' works.

Current values of other products are:

Pyridine, about 20s. per gallon, filled into buyers' drums.

Phenol, 4⅜d. to 4⅝d. per lb.

Pure benzole and pure toluole, 2s. 1d. to 2s. 2d. per gallon.

Solvent naphtha, 95/160, 1s. 10½d. per gallon.

Tar Products in the Provinces.

Dec. 7.

The market for tar products has remained fairly steady throughout the past week.

Pitch is in fair demand, and there has been a slight rise in the value, although this is probably due to a certain amount of speculation.

Creosote price remains the same.

White products are fairly firm.

The average values for gas-works products during last week were: Gas-works coal-tar, 35s. to 40s. Pitch, East Coast, 49s. 6d. to 52s. f.o.b. West Coast—Manchester, 44s. 6d. to 47s.; Liverpool, 45s. 6d. to 48s.; Clyde, 50s. to 51s. Benzole, 90 p.ct. North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6⅛d. to 6⅜d.; salty, 6d. to 6⅛d.; Scotland, 5⅞d. to 6d. Heavy oils, in bulk, North, 6⅛d. to 6⅜d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

British Sulphate of Ammonia Federation Prices

The British Sulphate of Ammonia Federation, Ltd., in announcing their home prices for December, 1925, to May, 1926, write:

"Owing to the continued depression in the iron and steel industries, and to an unfortunate strike affecting the production from shale in Scotland, the output of sulphate of ammonia is far below normal, and supplies in the spring months may not suffice to meet the home demand. It is therefore essential that orders should be booked well in advance of requirements this season. We do not propose to take advantage of any shortage of supply to raise prices, but as many of our members' works are idle or working short time, we may be put to considerable extra expense in meeting delivery charges. We therefore reserve to ourselves the right to raise the prices given below at any time.

"We offer to sell sulphate of ammonia for home agricultural use at the following prices for delivery in: December, £12 13s.; January, £12 15s.; February, £12 18s.; March-May, £13 1s. per ton for neutral quality in fine friable condition, free from lumps, basis 21·1 p.ct. nitrogen. Delivered to consumer's nearest station or wharf in Great Britain, for prompt cash payment, in lots of 4 tons and upwards. Neutral sulphate of ammonia as described above, guaranteed not to contain more than 0·025 p.ct. free acid, will be sold on the basis of 21·1 p.ct. nitrogen, with no charge if over 21·1 p.ct." The allowances are as stated in the "JOURNAL" for July 2, 1924, p. 196.

Chesterfield Gas Undertaking.—The Chairman of the Chesterfield gas undertaking, Alderman G. Clark, in welcoming the members of the Chamber of Trade who recently visited the Department, stated that the Corporation had £250,000 invested in the gas undertaking. They were not out to make a profit on the new service department, but to give satisfaction to the customers.

CONTRACTS OPEN.

Sulphuric Acid.

Tenders are invited by the Littlehampton Gas Company for a supply of sulphuric acid. [See advert. on p. 677.]

Coal.

The Skipton Urban District Council are inviting tenders for the supply of gas coal and washed nuts. [See advert. on p. 677.]

Fireclay and Silica Goods.

Tenders are invited by the Gas Committee of the Manchester Corporation for the supply of certain fireclay and silica goods. [See advert. on p. 677.]

Meters.

The Gas Committee of the City of Leeds are inviting tenders for the supply of ordinary and prepayment dry gas meters. [See advert. on p. 678.]

Carbonizing and Coal Handling Plant, and Scrubber.

The Urban District Council of Colwyn Bay and Colwyn are inviting tenders for extension to coal handling, storing, and carbonizing plant, and for a tower scrubber. [See advert. on p. 677]

EXTENSIONS.

New Mains for Blackburn.

The Blackburn Town Council have decided to borrow £10,000 for the laying of gas mains on a new arterial road and housing site.

TRADE NOTE.

Carbonizing Plant for Teignmouth.

Messrs. W. J. Jenkins & Co., Ltd., of Retford, have been successful in securing the contract for the carbonizing plant for the Urban District Council of Teignmouth. The contract consists of: Bench, bench fittings, stoking machine, coal plant, generating plant, and steel retort-house building.

Stourbridge is to have better lighted streets; the Town Council last week deciding to increase the number of lamps to 80 p.ct. of those that were lighted in pre-war days.

The Ross Urban District Council, in adopting electricity for street lighting for the coming winter, expressed regret that the Gas Company did not send in a tender when asked to do so by the Council.

Mr. N. B. Thompson, Assistant Gas Engineer to the Skipton Urban District Council, gave a public lecture last week on "Our Gas Supply," under the auspices of the Skipton Adult School. It was one of a series being delivered on phases of local government.

It was reported to the Blackburn Town Council, on Dec. 3, that the Blackburn and District Master Plumbers' Association had written concerning municipal trading in the Gas Department, and requesting the Mayor and members to receive a deputation to discuss the matter. The question was referred to a Committee, who were empowered to meet the plumbers in conference.

The Stockton-on-Tees Corporation have received a protest from the adjoining borough of Thornaby against the increase in the price of gas supplied by Stockton. The resolution urged that, in view of the fact that large sums had been taken from gas profits for the relief of Stockton rates, the deficit this year should have been met out of the reserve or borough funds, which had benefited so much at the expense of the gas consumers. The Corporation decided to take no action in the matter.

An explosion took place on Monday morning, Nov. 30, in the blast main of the Bath Gas Company's carburetted water gas plant, destroying a portion of the main and one of the fans. It was, however, found possible to make a temporary connection with one of the fans which was undamaged; and the plant was got to work again within thirteen hours of the occurrence. A full supply of gas was maintained throughout, and nobody was injured; but the windows and roof of the building suffered some damage.

For NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS

See last week's "JOURNAL," p. 608.

Telegrams: "GASKING, FLEET LONDON." Telephone: Central 6055.

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